

SPECIAL: IN THIS ISSUE

4 new departments on Creative Engineering

The story behind the
"COMPLETELY INTEGRATED
PROCESS." An interview
with Wally Brainard
Kearney & Trecker Corp.
page 107

A Httchcock Publication

SEPTEMBER, . 1959

5 Basic Reasons why MARVEL HACK SAWS CUT-OFF MORE ACCURATELY...

The consistently accurate performance of MARVEL Heavy Duty Hack Saws is no accident. MARVEL engineers knew, many years ago, that to produce and maintain accurate cutting-off, a hack saw must be designed and built like a fine machine tool.

Some of the basic design principles built into the modern MARVEL Hack Sawing System that makes it the most accurate cutting-off method you can use are:

1. V-Way Design...Greater Rigidity

Upright and Saidle are precision machined and fitted to form a rigid, integral unit capeble of withstanding any cutting load with no deflection or side movement.

2. Anti-Friction Bearing Construction

Anti-friction ball or roller bearings are used at all load carrying points. Even the strongly braced suw frams reciprocates on heavy duty, fully enclosed preloaded ball bearings which provide permanent, frictionless rigidity and true-running, straight line cutting strokes.

3. Minimum Blade Frame Reach

Close-coupled design and crank lever action of MARVEL Saws keeps the saw frame and blade reach very short in relation to the vertical V-ways on which the unit is mounted. This insures optimum rigidity, even under the most severe operating conditions.

4. Positive Relief Blade Lift

On the return stroke, positive relief lift raises the blade to provide proper and "cushioned" lead-in on the next cutting stroke. This prolongs blade sherpness, life and accuracy.



5. Rigid Cutting Tool

Cutting-off accuracy requires a rigidity held, relatively short cutting tool. MARVEL Unbreakable High-Speed-Edge Hack Saw Blades, which combine a narrow high speed steel cutting edge permanently welded to a tough alloy steel body, can be tensioned from 200% to 300% more taut than ordinary blades. This provides a most eight cutting edge.

Catalog C85 has complete details, facts and figures on both Marvel metal cutting Hack Saws and Band Saws. Write for it today.

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ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL

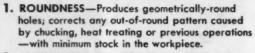
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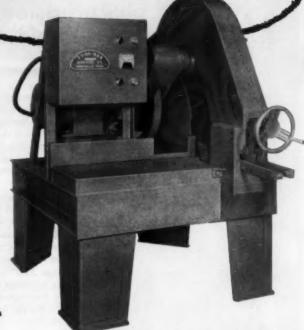
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SA Non-reversible

- (for machines with reversing spindles only)

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- * Quick change of taps when different size holes are topped in the same work piece (or 2nd and finishing tap)

Length Incl.

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SA-OE	5%,"	194"	0-1/4"
SA-1B	77/8"	234"	3/4-3/4"
SA-28	11"	4"	3/4-11/8"
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SA-3C	1534"	61/2"	11/2-2"

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Four styles available:

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Shaping Attachment adds shaping and slotting operations to the variety of Toolmaster jobs. Illustration shows how angular surfaces are shaped.

TTER AND TOOL GRINDERS . ELECTRICAL DISCHARGE MACHINES

CINCINNATI



Unlocked position * In this position tools are inserted or removed.





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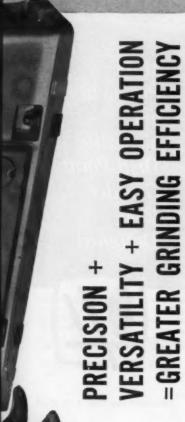
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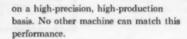
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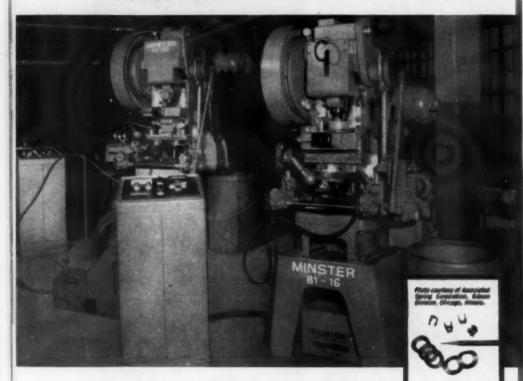
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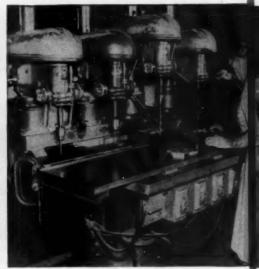
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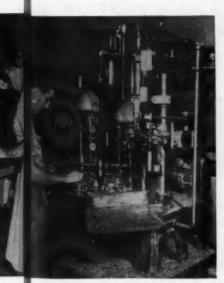


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14" Drill Presses, also 14" Super-Hi Sensitive and 15"

You'll save money three ways when you put Delta Tools to work in your shop: they cost less to buy, less to operate, and less to maintain. They're ruggedly built to withstand hard wear, yet are completely mobile—offer you precision to meet the most exacting requirements.

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Write for FREE Delta Industrial Catalog. Rockwell Manufacturing Company, Delta Power Tool Division, 610J N.Lexington Ave., Pittsburgh 8, Pa.

See Delta Industrial Tools at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

TOOLS

FOR INCREASING PRODUCTION



Compact—provides maximum fixture clearance when installed.

Anti-Friction Arbor Support Bearings

Simple to install—use these anti-friction bearings to INCREASE arbor rigidity, tool life, ELIMINATE chatter, and REDUCE maintenance costs. Only one bearing required for various arbor sizes. Standards for popular makes of milling machines.

ALSO—Free-running pilot bearings and combined linear-rotary motion spindle bearings designed and manufactured to order.

Precision Boring Heads . . . adjust to TENTHS in SECONDS without loosening or tightening any screws

Rigid construction and rapid tool adjustment without the use of indicators makes these heads ideal for close tolerance boring. Adjust to .0001 without loosening or tightening any screws—avoiding deflection. Standards and specials.



Size—Positive Adjustment Guaranteed

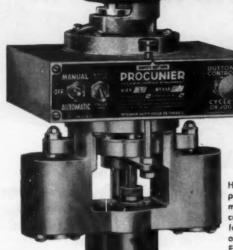
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MANNE MEG. CO.

1165 SEBA ROAD . PONTIAC, MICHIGAN

A SUBSIDIARY OF GODDARD & GODDARD CO.

NEW LOW COST LEAD SCREW TAPPER



operating control

- Produces Gauge Perfect Parts
- · Eliminates parts spoilage, inspection
- * Saves Taps, Reduces Fixture Costs
- * Fast, Economical, 6-way Operation

Here is truly the most accurate, most precise, cost-cutting tapper on the market! New, different, flexible, it can be operated with push button and foot control for cycle or jog, automatic or with switch in fixture for full cycle. Either way, it provides a uniformity, speed and precision accuracy that's unparalleledl

Here are just a few features: uniform threads in any pitch, from 20 to 96.

positive depth stop.

depth stop holds uniform depth to with .005".
tap capacity 0" to 3/16" in

lead screw travel 1-3/16".
"safety return" stops tapping

Easy to Operate — Pays for itself!

Push button releases electrically controlled air pressure engaging sensitive friction engaging sensitive triction clutch which actuates lead screw. The tap, completely controlled by lead screw, is fed gently, automatically without pressure. The result is repetitive uniformity and pre-cision that never varies! Tests proved all tapped parts passed 100% inspection—without reinctal

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Send for FREE Brochure

giving the full story of this amazing new tapping unit. See how you can enjoy higher quality topping, less tap breok-age, parts spoilage and increase tapping efficiency—for less cost! Write today!

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PROCUNIER SAFETY CHUCK CO., Dept. 9 14 S. Clinton St., Chicago, Ill. Gentlemen: Please rush me yeur FREE brochure on the new Lead Serew Tapping Attachment.

165 CARMET INDEXABLE SQUARE CARBIDE INSERTS WOULD COVER THIS PAGE





New, sharp cutting edges for about 10¢ each to do almost all metal cutting jobs

Individual, brazed singlepoint tools. No tool regrinding.

Minimum tool changing.

Over 118 styles and sizes of Indexable Inserts to use in Carmet high-alloy, cadmium plated Tool Holders in both positive or negative rake types.

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This 32-page first edition contains prices and complete specifications on Carmet's full line of cemented carbide tipped tools, Indexable Inserts, bianks and holders. Speed and feed charts, grade comparisons and ordering information included.

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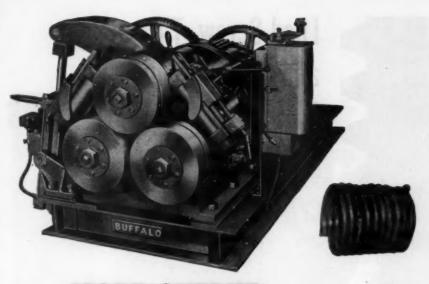
Why not find out more about Carmet Indexable Inserts and the complete line of Carmet cemented carbide tools and standard blanks? Your Carmet distributor carries them in stock, assures prompt delivery and will aid you in selecting the proper grades and styles to cut your metal-working costs. Call him today or write Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.

W8W-738



CEMENTED CARBIDE DIVISION OF ALLEGHENY LUDLUM STEEL CORPORATION





MORE OUTPUT Per Man Hour with "BUFFALO" BENDING ROLLS

These rugged, heavy-duty machines provide the ultimate in fast, easy, low-cost bending of circles, arcs, spirals or segments. Widely used in the aircraft and automotive industries, steel mills and by heavy equipment builders. Easy roll changes and diameter adjustments eliminate need for expensive dies and highly skilled workers. Upper roll is lowered and set or quickly released hydraulically.



 Exclusive "Buffalo" "Leg-In" Attachment simplifies and speeds difficult bending of angles leg-in.

For fast, profitable production of accurate curves, investigate "Buffalo" Bending Rolls. Call your "Buffalo" machine tool dealer, or write for Bulletin 352-D.



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Lead-screw threading and tapping attachments for Greenlee Automatics make it easy to thread parts otherwise impractical for automatic bar machine operations. Smooth, precision threading with excellent finish make this type of operation profitable for you.

Look over the threaded products at the right . . . then ask your Greenlee Representative to show you this and other ways Greenlee Automatics can help you beat rising production costs.



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With the sure, careful touch of an experienced hand, veteran CTW heat-treat man hoists 72' broach from a vertical furnace.

Thirty years of broachmoking —careful creation of thousands of standard and custom-made broaches — assures unmatched efficiency and performance from CTW Broaches.

Find out how Continental's experience can cut down-time and increase output in your operation. Call your Ex-Cell-O Representative. In Canada, contact Colonial Tool Co., Ltd., Windsor.

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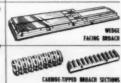
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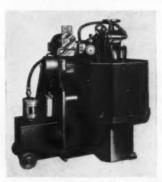


OLIVER Template Tool Bit Grinder

Duplicates Precisely in One Operation

That's right! The Oliver Template Tool Bit Grinder sharpens single point tungsten carbide, high speed and stellite turning tools . . duplicating exactly all original flats and radii every time the tool is ground . . . in one simple, efficient grinding operation.

How is it done? Well, as you can see from the drawing above the answer lies in "template control." The template at the top of the specially designed tool holder is a twice size replica of the tool form being ground. The tool, securely held at mid-point in the holder, contacts the wheel and is ground until the template touches the template stop. In this manner, the tool is ground to the exact profile



of the template. The entire operation is performed in seconds easily, accurately on one machine . . . a machine that pays for itself by reducing your tool inventory and by eliminating lost production time and tool breakage.

Want proof? Oliver will grind your tools on a "no charge" basis. Write today for full information. We'd like the opportunity of sending you a quotation.

OLIVER of ADRIAN

1408 E. Maumee St. . Adrian, Michigan

Now to add dividend to single point tools

The tool room can add four "divide areas" through use of the Oliver 2 Template Tool Bit Grinder and can pr tect initial investment in tool bits. dividends available to you are (a) ran sharpening, (b) positive duplication, grinding wheel economy and, (d) his salvage value.



The total time involved in sharpening tungsten carbide tipped tool bit is ner gible. An average 34" square tool calli for a total stock removal of about 14 is sharpened completely in approximate 30 seconds. This includes all angles, raand soft steel support.

Positive duplication is readily assure Once your tool engineer has determin the proper shape and clearance for be results, it is important that there be guess work on subsequent grinds. T Oliver template control insures such

Grinding wheel economy is extraordinar Practically all users have found seconda diamond wheel finishing of carbide tipp tools completely unnecessary. The diameter silicon carbide wheel produc a micro-finish almost equal to that ground with a diamond wheel.

Your tool bits can have a high salva value. It is common practice to discu tool bits when the carbide contains area which has broken out for a co siderable distance. The removal of damaged area is quite expensive by on nary grinding methods. The Oliver To Bit Grinder permits the removal of 1/4 or 14" of carbide in a minute or two thus giving you new tool performant once again at a very low cost.

WISE SWITCH to lowest costs per tool hourl "Job Proved" solid carbide Tools and Burrs aller ater Hal VALUE AMALYSES PROVE that the combination of high-speed machines and solid carbide tools is the most predictable investment you can make. Compared with the use of high speed steel tools, you'll find that you can get: A00 % 5ATHE PRODUCTION because solid carbide is tough enough to operate at speeds no steel can stand. 300 % 10MeSt 1000 LIPI because the rugged structure of solid carbide resists abrasion that quickly takes the edge off any steel. SMOOTHER PARSHES because the rigid, spring-free nature of any solid carbide holds it true to its axis of retation. LOW-COST RESIMASPENING by Heller's precision regrinding service is an extra dividend that reduces cost per tool hour even further.

INVESTIGATE: Ask your nearby Heller Distributor to tell you more about the 700 types, sizes and shapes of Heller Solid Carbide Tools and Burra. Catalog CT-3 tells the whole story. A copy beloags in your file.

Branch Offices and Warehouses: Newark, N. J. & Detroit & Chicago & Shroveport & Los Angeles & Portland, Oregon

HELLER TOOL CO.

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America's Oldest File Manufacturer

NEWCOMERSTOWN, OHIO

Subsidiary of Simonds Saw and Steel Co.

U.S. Press Room Equipment

and Full Profit Profit potential

U. S. Press Room Equipment is designed for "F.P.P." — to help make press operations more profitable for you . . . to give to each press maximum flexibility and efficiency.

In many cases, press room productivity depends upon the flexibility of your equipment. The wider the range of material your presses can handle, the more productive and profitable they can be. When you combine this wider range of production with increased efficiency, you are approaching a production standard ideal for press rooms.

It is this standard — which has as its aim the realization of Full Press Room Profit for you — that dictates the manufacture and performance of every piece of U. S. Press Room Equipment.

For example, U. S. Slide Feeds are precision built units for the accurate feeding of coil stock into punch presses. They are adaptable to the feeding of one or more separate strips of wire or flat stock, either of regular or irregular cross section.

U. S. Flat Stock Straighteners and Two-Way Wire Straighteners are perfect complements to U. S. Slide Feeds. When teamed together they guarantee accuracy and contribute to prolonged die life.

Write today for U. S. Bulletin No. 85B and learn how you can obtain maximum flexibility and efficiency for your present Press Room equipment — to give you your "F.P.P."





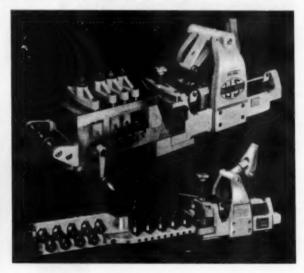


Some typical stack cross-sections readily accommodated by U. S. Slide Feeds.

Below: SF-1 U. S. Slide Feed with SS-07 Plain Stack Straightener on conventional OBI press.

Main Illustration Top: SF-68A U. S. Slide Feed with SS-27 Plain Steck Streightnern, Max. width capacity 6" feed langth adjustable up to 8". Lower SF-D U. S. Slide Feed with Two-Way Wire Streightener (nine rolls in each plane).





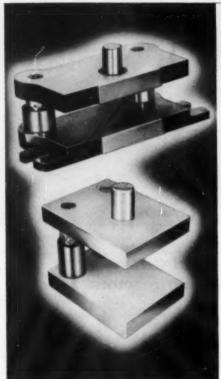


U.S. TOOL COMPANY, INC.

AMPERE (EAST ORANGE) NEW JERSEY

U. S. Multi-Slides® + U. S. Multi-Millers® + U. S. Automatic Press Room Equipment + U. S. Die Sets and Accessories

ONLY LEMPCO DIE SETS OFFER YOU "MINIMUM MAINTENANCE" OPERATION



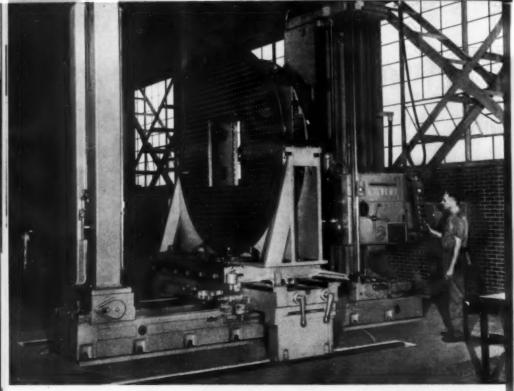
Operating on Ball Bearing Bushings, with Aluminum Alloy Retainers, Lempco Die Sets deliver millions of strokes, retaining phenomenal precision of alignment, requiring only an occasional dab of grease for lubrication.

NO OTHER DIE SETS HAVE LEMPCO FEATURES!

Better look at those Lempco "M" and "L" style die sets, too; they're *all-steel* yet sell for the price of cast iron.

Write today for Catalog and Price Lists.





Courtesy Combustion Engineering, Inc.

Combustion Engineering uses Gilberts for precision boring on atomic reactors

It takes an unusual boring mill (specifically, a Cincinnati Gilbert) to meet the specifications on this job:

- (a) diameters within .001",
- (b) parallelism of center line of holes to center line of plate within .0001" per inch,
 - (c) parallelism of flat surfaces within .010",
 - (d) 32 R.M.S. surface finishes.

These are some of the machining requirements on this part for a fast breeder reactor built in the Chattanooga plant of Combustion Engineering, Inc., pioneer manufacturer in the nuclear field. They are typical of the quality of work assigned to this Cincinnati Gilbert table type horizontal boring mill. Automatic positioning makes work-handling fast and precise.

A number of other Gilbert boring mills are producing similar close-tolerance work for Combustion Engineering—proof that "those who buy Gilbert buy Gilbert again."

New Bulletin 1157 will show you why Gilbert boring mills do so many things so well.

The Cincinnati Gilbert Machine Tool Co 3352 Beekman Street, Cincinnati 23, Ohio.



Ask for free catalog 1157

GILBERT

MOLYKOTE

news

PUNCH LIFE INCREASED FROM 2,000 to 25,000 HOLES IN STEEL PLATE



Those punches (11/18") were used punch 25000 heles in 1/2", 1020 celd re steel plats. Without MOLYKOTE Lubrice o maximum life of only 2000 heles or be obtained.

A West Coast manufacturer was ex-periencing low punch life with the best conventional lubricants. Their multiple punching operation consisted of cold shearing 50 holes simultaneously in a single steel plate. A maximum life of 2,000 holes per punch was obtained with ordinary lubricants. ordinary lubricants.
Then, MOLYKOTE Type G was ap-

plied to the punch occasionally. The result: punch life was increased from 2,000 to 25,000 holes which afforded substantial savings.

When writing, refer to Item 508

"A LITTLE BOTTLE FOR A BIG JOB"



- For Extendis
 Die Life.
- For Preventing Metal Pickup.

Try it . . . Order a 10 ounce container of MOLYKOTE Type Z TODAY!

When writing, refer to Item 507

MOLYKOTE CANNOT BE SQUEEZED OUT RE-GARDLESS OF PRESSURES: EXCELS AS COLD-FORMING LUBRICANT IN METALWORKING

Distortion, Stick-Slip and Fretting Eliminated . Mounting Loads Reduced . Chatter and Noise Avoided . Allows Easier Disessembly

In metal forming the most difficult problem to overcome is scuffing from metal pickup on the dies. Direct contact of bare surfaces of a piece undergoing formation with the die often results in galling, scuffing, etc. If the surfaces can be separated by a lubricant of sufficient film strength, metal pickup does not occur.

Before new dies are used, burnish them with MOLYKOTE Type Z. If the lubricant you are now using does not have sufficient film strength and galling does occur, use MOLYKOTE on your

The automobile industry which forms and fabricates vast tonnages of various metals, uses MOLYKOTE Type Z extensively.



plying MOLYKOTE Labricant to food at the Bessick Company, Bridgeport, in a forming apparatus

When writing, refer to Item 505

DAMAGE DUE TO IMPROPER MACHINERY "WEAR-IN" CAN BE ELIMINATED WITH NEW COMPOUND

Wear-in damage is often serious enough to require costly reconditioning of new equipment and if the damage is not repaired, it will interfere with and reduce the useful service life of expensive machinery. During this critical wear-in period, damage due to galling, scoring, tearing, scratching, excessive abras-ion and seizing is an inherent hazard. MOLYKOTE WEAR-IN COMPOUND is the most effective lubricant yet de-veloped to combat this damage.

In seven different ways, MOLYKOTE WEAR-IN COMPOUND seves you time

- and money: 1. Shortens "wear-in" period without
- use of obsaires.

 2. Reduces gelling, seizing and excessive wear during the critical "wear-in" period in new or rebuilt machinery and after the installation of re-
- placement ports.

 Offers the best safeguard against costly reconditioning work and shipping delays due to the "brooking-in"
- of new machinery, ...
 Eliminates "stick-slip" behavior and resists golling and seizing at boaring

- pressures for beyond the yield point
- of any metal.

 Specifically designed for "weer-in"
 use. MeS, particles make intimate
 contact with bearing surfaces. Will
- not scrape off.
 Need not be burnished into surface.
 Brush or wipe on a thin coating.
 Inexpensive . . . a little goes a long

way. When writing, refer to Item 506

Address your letter to The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn. Phone: FIreside 8-3724.

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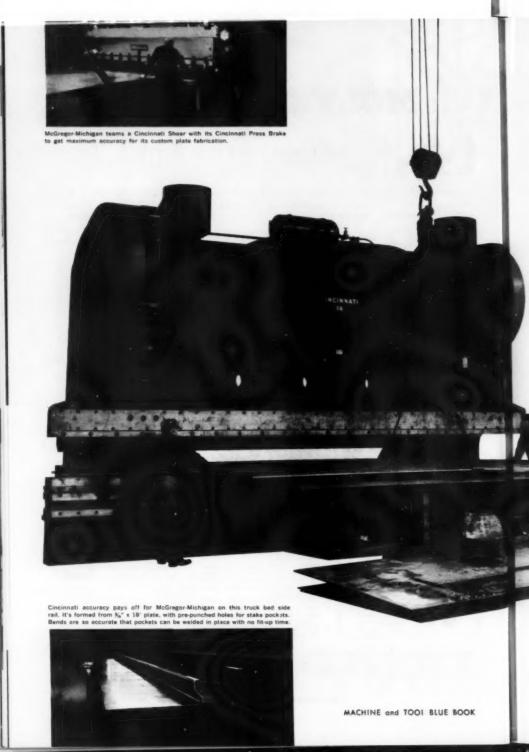
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BREAKING LUBRICATION BARRIERS

. . . THROUGH RESEARCH



This CINCINNATI® PRESS BRAKE means

bigger jobs fewer weld seams less handling easier operation

All four of these advantages mean money to McGregor-Michigan Corporation, Detroit. And they got all four of them when they bought a 36 Series Cincinnati Press Brake to be used along with their Cincinnati All-Steel Shear.

As a result, "this new brake . . . helps us be more competitive with some of the larger shops," says R. Hilprecht, sales manager of this steel plate fabrication shop.

This is just one example of the way Cincinnati Press Brakes and Shears are cutting costs and opening up new business for shops across the country. They quickly pay for the extra refinements you get in Cincinnati-built machines.

Write Dept. H for new Catalog B-12, and pick the brake that will mean new profits for you.

Shapers / Shears / Press Brakes



THE CINCINNATI
SHAPER ...

Cincinnati 11, Ohio, U.S.A.

LAP FASTER more accurately WITH FLEXOLAP



Flexolap features an expansion barrel with off-center longitudinal slots that "give" under pressure of the adjusting pin —allow up to 15% expansion. Easy, accurate take-up saves valuable time, enables you to lap rounder, straighter holes.

Extra flexibility eliminates danger of galling or seizing.

SET NO. 1

includes 6 complete laps, one of each size (1/6", 1/4", 1/6", 1/4", 3/4"

OTHER SIZES

available are ½", ½", ½", ½", ½", ½", ½", ½", %", %", ½", ¼", and Midget Lapsin sizes.032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218 and .250. Trial assortment of 17 midget laps, \$2.10



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Let a Manhattan sales engineer show you how to increase production efficiency . . . get "More Use Per Dollar" at your shop with Manhattan Reinforced Cut-Off Wheels and other types of Manhattan high speed, heavy duty wheels.

LOWER COST **PRODUCTION** GREATER **CUSTOM-MADE** FOR YOUR JOB





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MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY RAYBESTOS-MANHATTAN,

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PRECISION ANGULAR SET-UPS



MAGNA-LOCK SINE makes 'em easy!

You're set-up and ready to roll in *minutes*, not hours. No fussing around with dials or scales. No complicated fixtures. Standard gauge blocks do the trick. The easy portability of the permanent magnet chuck adds to the ease of making quick set-ups.

Precision-made Magna-Lock Sine meets the precision requirements of this missile age, saves time and cuts costs. Available in single

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MAGNA-VISE enables magnetic chucks to hold nonmagnetic materials ASK ABOUT IT!



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Through each and every stage in the manufacture of a Pipe Machinery gage, our operators feel a very real -a very personal responsibility for the quality of the product they are helping to produce.

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Special vacuum chucks for holding non-ferrous parts



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PORTAGE...3" diameter horizontal milling, drilling and boring machine

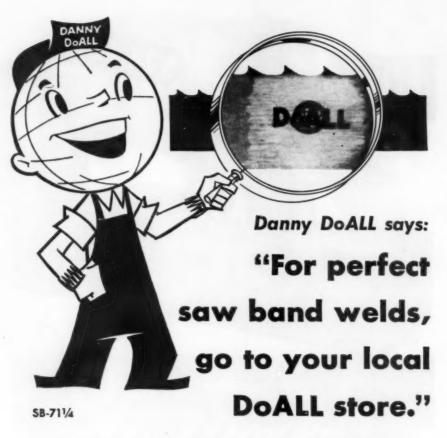
Mr. Buyer...here's a 3 inch bar machine you can't afford not to investigate. It's new from the top of the column to the bottom of the base...<u>All new</u> speeds and feeds, plus a versatility of job applications make it a real money maker. <u>All new</u> construction features offer a truly strong, rugged machine...and the pay-off... it's priced amazingly low, every shop can afford one ... write, wire or phone for complete information.

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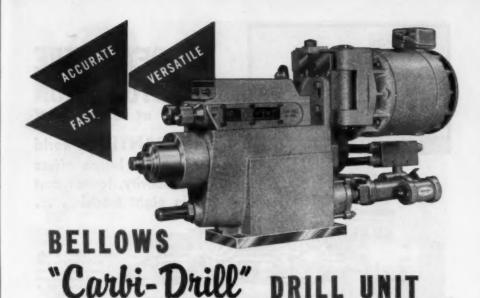
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They use the ultramodern HSW-100 welder to produce perfect welds—having 3½ times longer flex life. Welds are guaranteed stronger, teeth perfectly matched and no grinder undercut. You'll get weld perfection in DoALL carbon or Demon® HSS saw bands.

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- Runout not over .001"
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The rugged, heavy-duty "Carbi-Drill" is ideal for use in toolroom-built special-purpose machinery for high speed precision drilling, tapping, reaming, counterboring, etc. Extremely versatile, "Carbi-Drill" units can be mounted in any position, are easily synchronized with each other or with other Bellows "Controlled-Air-Power" Devices for fully automatic operation. Air powered rapid advance and retract, hydraulic feed rate adjustable for any tool working in any material.

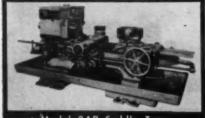
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1342 B

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at lowest cost!

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Model TMBOP is fully automatic with feeds and speeds in all directions proselected on a simple panel.



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From MINGANTI,

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a remarkable line of standard

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models that correspond
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and 1A and 2A saddle types . . .
PLUS automatic cycle models
that provide full program control

without tape. Standard U. S. Tooling

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Model 1AP, saddle type, \$17,990
Completely equipped with motor.

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It takes fast, automatic feeding to satisfy the appetites of today's automatic assembly machines. And nowhere can you duplicate the range of equipment, the specialized experience in selective feeders offered by Detroit Power Screwdriver Company.

The most complete line in industry, DPS parts feeders include rotary, vibratory and elevator types. They handle any product from the tiniest of screws to assembly components the size of your fist . . . range in holding area from eighty cubic inches to 20 cubic feet.

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ROTARY HIGH SHELL FEEDER for maximum holding capacity.



DPS will welcome an invitation to analyze your assembly operations. Write today. Ask for catalog on selective feeders.



September, 1959

OK



LOOK into some of America's leading tool rooms to learn how to make your production tools the finest! You'll find that many of the foremost hardeners entrust their precious high speed tools only to the Sentry Diamond Block method of atmosphere control.

The reason why? Sentry hardening is sure. Valuable tools of any steel hardening above 1700°F, can be fully hardened without danger of scale or decarburization. Surface spoilage is positively eliminated.

A demonstration of bardening on your own tools will convince you of Sentry benefits. Why not send us samples?



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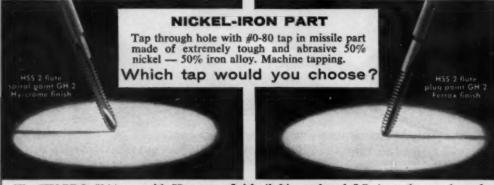


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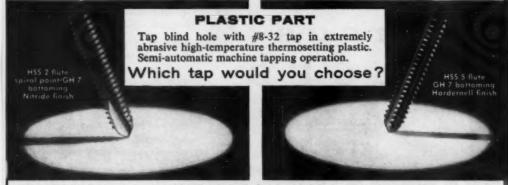
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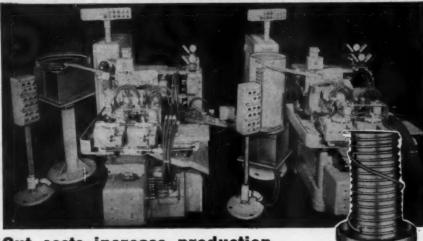
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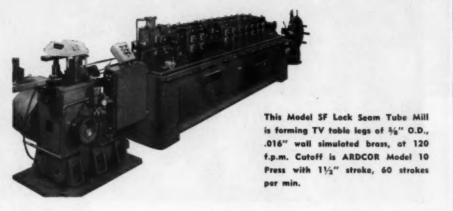
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Val Koller tells why he continually adds more Moore Jig Borers and Jig Grinders to his team

This is another in a series featuring the views of owners of leading tool and die companies.



by VAL KOLLER President Koller Die & Tool Co., Milwaukee, Wisconsin Manufacturer of Dies and Metal Stampings-Tools-Jigs-Fixtures and Gages-Special Machines



Moore equipment in Koller plant, with new #3 Jig Grinder in foreground.

"Since our foundation in 1919 it has been my personal objective to strive for perfection. Since that time perfection has evolved into a .000010" word for tool and die makers. Such precision is rapidly becoming common-place...particularly in electronics and guided missile fields of production. With the installation of Moore equipment in 1950, we have been able to compete successfully in a caliber of work that before was not possible.

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we recently added another teammate to our toolroom ...the new Moore Model #3 Jig Grinder. This machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better."

Write today for literature describing the unique features of #3 Moore Jig Borers and Jig Grinders or see our catalog in SWEET'S MACHINE TOOL FILE.

MOORE SPECIAL TOOL COMPANY, INC.

728 Union Avenue, Bridgeport, Connecticut



This 116 cavity mold plate was completely jig ground at Koller on a Moore Jig Grinder. Tolerances: hole location ± .0001", hole diameter ± .0001".



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Manually-loaded No. 10 machine for having bearing rad ends, 4995" to 1.003" bares, with stack removal of 006"/008" Production, 131 pieces per hour, 80% efficiency.



Automatic fixturing on a Model
10 Automatic-Load Machine is
shown here. Machine is available with air-operated 6-stothen
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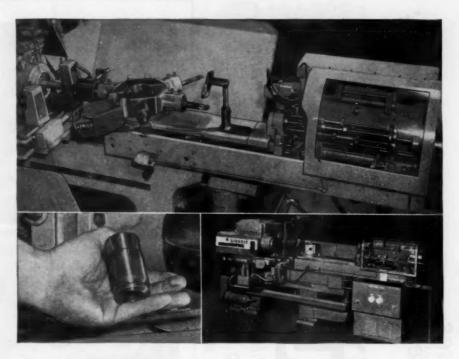
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MACHINE and TOOL BLUE BOOK



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Floor-to-floor time on the job shown here—a threaded collar $3\frac{1}{3}$ fong with $1\frac{13}{2}$ diam.—was cut from 8.1 minutes (with hand operation) to just 3.25 minutes. All operations and machine functions are automatically controlled with the Lynn Hydraulic Drive Unit on a Gisholt Ram Type Turret Lathe.

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drilling. Spindle speed automatically decreases as tools on the front cross slide form the 0.D., drops into lower speed as 0.D. is threaded, and into another low speed as radii are formed on the finished part and on the end of the bar stock. A tool on the rear cross slide cuts off the finished part and the job is done in record time.

With its massive design, reserve power and extra spindle speeds, the new Gisholt MASTERLINE Ram Type Turret Lathe is particularly adaptable to complete automatic operation with Lynn Hydraulic Drive. Contact your Gisholt Representative. He has the complete facts—and his wide experience may point the way to more profitable operation for you.



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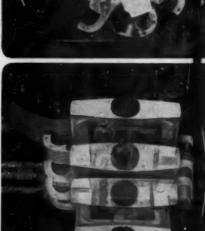
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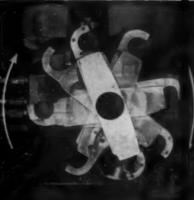
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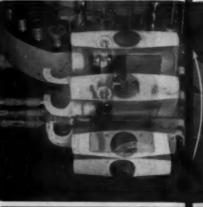
September, 1959

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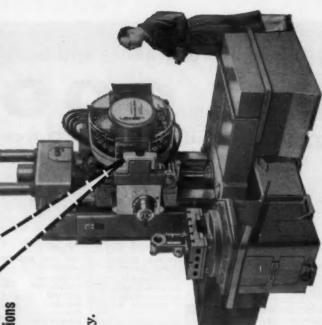
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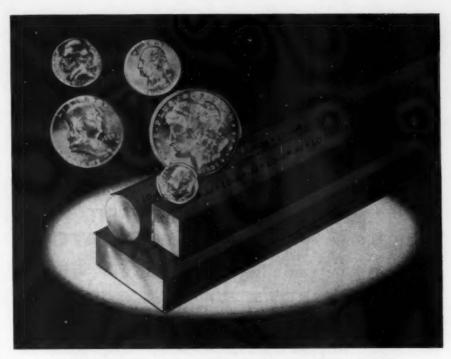
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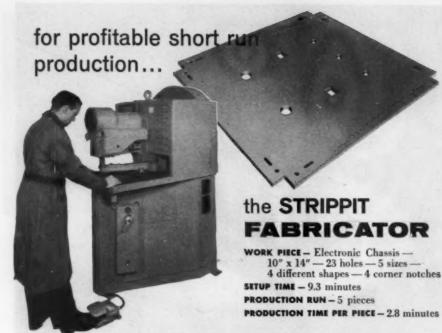
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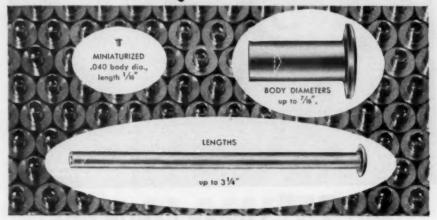
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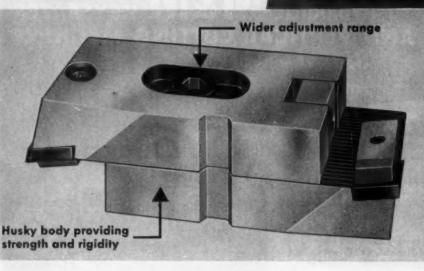
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MACHINE and TOOL BLUE BOOK

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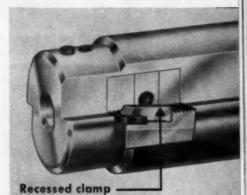
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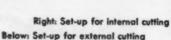
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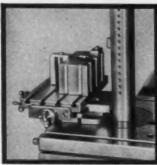
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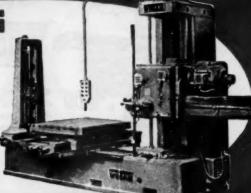
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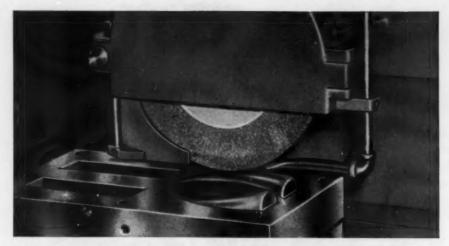
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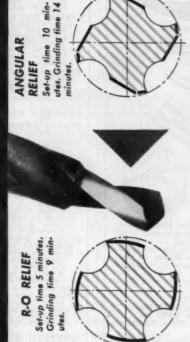


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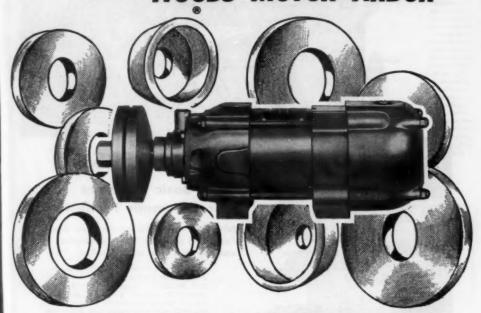
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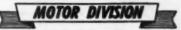


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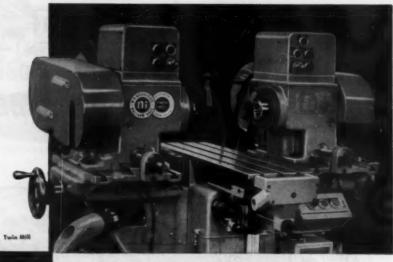
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- CREATIVE ENGINEERING—A new feature in Machine & Tool Blue Book is the presentation of four new departments by four engineers who are outstanding in their respective fields. In their respective "columns" on engineering-tooling, process engineering, dies and presswork and cutting tools, these columnists will stress good basic engineering practices. There will be references to fundamentals that you once knew but may have forgotten or neglected to use. Some of this basic material can be the springboard to a good idea you can use in your plant—creative engineering in the strict sense of the word.Pages 89 to 104
- SEEN AND HEARD IN INDUSTRY is the name of another new department. This "column" is written by Editorial Director William F. Schleicher, and this month Bill passes on some of the thinking of Ex-Cell-O Corporation's Glenn Bixby and Art Schulz; Fisher Industries' sales manager, Jim Shannon; and Ed Cyrol, the management consultant who makes some interesting comments on labor and automation.Page \$5
- NEW MANUFACTURING CONCEPT developed by Kearney & Trecker Corp. has made a big impression on small lot manufacturers. Wally Brainard, chief engineer of the Servo Machine Tool Division, is interviewed by Wm. F. Schleicher to present some of the underlying philosophy which brought about the development.

 Page 107
- MILLING A WORK HARDENING MATERIAL—Problems involved in milling a forging of Jessop No. 9 involved work hardening and "snaking" under heavy cutting pressure.Page 115
- work simplification problems can benefit from a wider use of simple examples during discussion group meetings. Author Harold R. Nissley describes an effective device to use in demonstrating the relationship between distance and time and weight and time in moving light objects short distances. Page 122
- FINAL FINISHING PROCESS—Microstoning is a new finishing process and is accomplished by using an attachment on a lathe or boring mill to generate a controlled micro-inch finish .. Page 132

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seen and heard in industry



By William F. Schleicher Vice President, Editorial Director Hitchcock Publishing Co.

• "Free trade is a two-way street, and it's only fair that tariffs be removed among all countries and not only in the U.S." So said Glenn Bixby, pres. of Ex-Cell-O Corp., who made a stir in a recent speech in which he spoke against high protective tariffs for machine tool imports. He believes if we

allow free trade to enter this country, foreign countries should permit the same for American products. France, has restrictions on the import of autos. Other countries have restrictions of one kind or another. Mr. Bixby had no answer to the situation which would alleviate machine imports. "I think we've got to look at the larger picture of the world and not only at our own economic interests. The stakes are higher than mere local business interests. Machine tool imports are part of a big problem and I don't really know what the answer is."

- Ex-Cello-O's Art Schulz discussed some interesting trends in their machine tools. Parts which were cumbersome and few in number had to be machined on a special machine. With the growth of industry more of these parts are required; consequently these one-time-specials are now standard models. This appears to parallel developments among other machine tool builders.
- "Automation and semi-automation is not a high school debate; to us it's life or death. And it's the same for many companies like us." So said Jim Shannon, sales manager for Fisher Industries, Inc. Fisher makes clips for holding the trim on automobiles. The auto industry uses 3 to 4 million

clips a month. The competition is rough, price always a big factor. "Our labor rate (Detroit) is so high we must eliminate all secondary operations and make clips out of a single piece or our out-of-state competition, with lower labor rates, underprices us. An out-ofstater can produce 850 parts as cheaply as we produce 1500. Our only answer is to automate wherever we can." Fisher's dies are highly ingenious. Some contain as many as 28 stations, the average is 18 to 20. Tapping or staking is performed as a primary operation after stamping. The speed with which stock feeds through the press is such that should a reject appear almost 1000 pieces have to be tossed out before the press can be stopped. "To put it bluntly," Jim said, "if we sell labor we're out of business. We've got to sell production." They've almost entirely eliminated their die making facility because of the high labor cost.

- Labor, in many respects, is a commodity and can price itself out of the market as surely as can a vacuum cleaner, bar of soap or automobile. With constantly rising labor costs either automation takes over or a business fails. If the man becomes more expensive than the machine the machine will take over. No amount of Congressional hearings, labor debates or strikes will alter this prime fact.
- Ed Cyrol, pres. of the firm, E. A.
 Cyrol and Co., Management Consultants, made some trenchant observations on labor and automation. "We know business must automate," Ed said, "We further know this will result in displacement of the work force, in

some lavoffs. However, in a rising economy these people will find employment elsewhere. Now, the unions know they cannot prevent business from installing money-saving equipment; instead they will insist on high severance pay, rigid seniority, and insist, with all their might, on "past practice" rules. 1959 will probably be the last year that wages will be an important bargaining subject. Future years, in fact, already started in steel this year, will place "past practice" clauses at the top of the list. Featherbedding, retention of displaced employees under one guise or another will receive emphasis. Business will then have both the expense of the equipment and a high labor cost."

And the end result of all this? Higher prices, inefficient practices, more non-productive labor, avalanche of foreign imports at lower prices, the stultifying of our economic growth. The economy could collapse of its own weight. Ed, always one to see further into the industrial future than most mortals, sees "grave troubles ahead."

 Engineering and tooling know-how, better processing and machining practices are often given a back seat in the excitement of keeping up with changing manufacturing and economic thinking. So as not to overlook good practices while presenting news of advanced techniques BLUE BOOK presents four new departments beginning in this issue and continuing each month hereafter. Each "columnist" is an authority in his field. It is hoped a more balanced reading diet will result from the combining of good basic practices and advanced manufacturing thinking type of articles.



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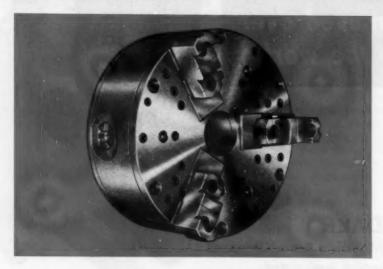








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ENGINEERING and TOOLING



FRICTION-IT MUST BE REGARDED AS A FORCE

■ The first principles of theoretical mechanics cover a wide and important scope of topics not the least of which is friction. Friction is like money, when understood and used correctly it can be of real value, but it can have a harmful effect when not appreciated or its value miscomprehended and misused. The benefits and disadvantages of friction are too many to list. However, a thorough knowledge of the subject can enable a person to optimize the the benefits and minimize the disadvantages.

Friction is the surface resistance which opposes the motion of one body upon another. It must be regarded as a force, although it is not always natural to think of it as such; the reason perhaps, is that its action in resisting motion is of a negative character. The force of friction always acts in a direction parallel to the surfaces in contact.

Kinds of Friction

(A) A distinction is made between friction at rest, usually called static friction, and friction of motion called kinetic friction. Static friction is the resistance to be overcome in starting a body in motion, and kinetic the resistance that continually accompanies the motion. Static friction is generally greater than kinetic, other conditions being equal. Kinetic friction can and does under some circumstances exceed static friction.

(B) When friction is mentioned, sliding friction is usually understood, such as that between a piston and cylinder wall, machine tool ways, etc. Whenever wheels,

rollers or balls are placed between the surfaces, the resistance is called rolling friction, the nature of which is somewhat different.

(C) Frictional resistance also occurs between the molecules of liquids and gases, or between them and any solid body with which they may be in contact as in the case of air against an airplane skin or an automobile or oil through a pipe. This kind of resistance is called fluid friction. Its action is very different from that of the friction of solids bodies, and it is different in its nature.

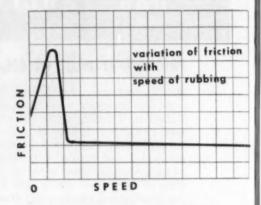
The graph in figure 1 shows how static friction values differ with kinetic in some mechanisms. However, this is not always the case.

Laws of Friction

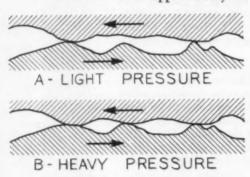
Laws of friction, first formulated by Amontons and later by Morin, have been modified and fall into two main divisions: unlubricated and lubricated surfaces.

1. Friction varies approximately as

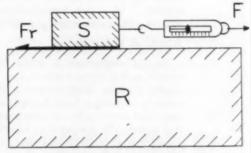
- the normal pressure with which the rubbing surfaces are pressed together.
- Friction is approximately independent of the area of the surfaces, but is slightly greater for small surfaces than the large surfaces.
- 3. Friction decreases with increase



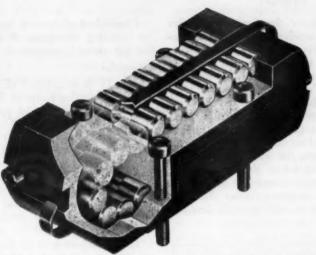
 Friction forces increase when starting. As speed is increased friction forces decrease as shown under normal conditions.



Irregularities in the surfaces, called asperities, cause friction. The tiny projections and depressions tend to interlock when surfaces are pressed together.



Force F required to move steel block with uniform speed against force of friction, Fr, between two surfaces can be read directly from the spring balance.



 Recirculating roller bearing, most recent development in the bearing field to eliminate sliding friction.

of velocity, except at very low velocity, and with soft surfaces.

The factors which determine the amount of friction in any particular case are so numerous and uncertain that only the most general principles can be stated positively. In fact, the laws of friction for lubricated surfaces are quite different for those of unlubricated surfaces.

The force of friction which opposes the starting of motion is called the force of starting friction, while the force of friction which opposes the sliding of one body over the other, is called the force of sliding or kinetic friction. The force of starting or static friction is almost always greater than the force of kinetic friction.

The finest machined, ground and lapped surface when viewed through a 1000 magnification microscope shows a series of hills and valleys called asperities as shown in A of Fig. 2. It is these irregularities in the

surfaces that rub together which cause the friction. The tiny projections and depressions tend to interlock (as shown in b of Fig. 2) when two surfaces are pressed together. The resistance to slipping produces heat and also wears away the surfaces when the resistance is overcome.

Friction is less when the surfaces are smooth and hard. Friction is usually much diminished by proper lubrication. Two well-oiled surfaces may show only one-fifth as much friction as the same surfaces when dry. With two dry surfaces friction does not depend on the area of contact between the sliding members. On the other hand, with well lubricated surfaces friction is nearly proportional to the area of contact.

Coefficient of Friction

The coefficient of sliding friction may be obtained by a simple experiment. Suppose for example, that we want to know the force of friction when one steel surface slides on another steel surface.

Take a small rectangular block of steel S as shown in Fig. 3 and place it on R. Pull horizontally on S with a spring balance. The force F, required to move it with uniform speed against the force of friction Fr between the two surfaces, can be read directly from the spring balance.

It will be found that the reading of the spring balance just before motion starts is greater than after the body is set in motion with uniform speed.

TABLE 1-Coefficients o	f Frie	etic	on .
Wood on wood, dry	0.4	to	0.6
Metals on metals, dry	0.15	to	0.2
Metals on metals,			
lubricated	0.03	to	0.08
Cast iron on bronze, dry	0.147		
Steel on bronze, dry	0.152		
Steel on cast iron, dry	0.204		
Steel on cast iron,			
lubricated	0.036		

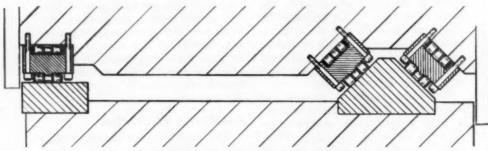
Figure 1 shows friction forces when starting. As speed is increased it is slightly decreased under normal conditions. Coefficient of friction is computed by dividing the force of friction F by the normal pressure S.

Example:

Letting
$$f$$
 = coefficient of friction
 F = the force of friction
 S = the normal pressure
 f = F
 S
 F = 20 lbs.
 S = 100 lbs.
then
 f = F or f = 20 or .2

In our experiment in Fig. 3, S is considered as the normal force. If the weight of the steel block remained the same but had a force of 300 lbs. applied to it the value of S would be 400 lbs. Then the friction force needed to slide block S would be 80 lbs.

The ratio of the force required to slide a body along a horizontal plane surface to the weight of the body is called the coefficient of friction. Therefore if the weight of a body and the coefficient of friction of the two bodies is known, the force to move the body is obtained by multiplying the



5. An application of the recirculating roller bearing principle.

coefficient of friction times the weight.

In table 1 are shown some coefficients of friction.

For a full treatment of the laws of friction for lubricated surfaces the Kents Mechanical Engineers' Handbook is a suggested source.

Rolling Friction

The surest way to reduce dry sliding friction, or partially lubricated friction, is to change to rolling friction. Almost everyone knows that rolling friction is less than dry sliding friction. This is so providing the rolling members, whether they are balls or rollers, are of the correct material, hardness and finish and also providing the same can be said of the raceways. Anyone who has seen a truck or wagon try to go through a very muddy field knows that rolling friction is only more efficient than sliding friction when the surface on which it rolls does not break down.

The coefficient of rolling friction of roller and ball bearings usually ranges between 0.0008 and 0.004 or about .01 of that of steel sliding on steel. Changing to rolling friction is advantageous because of simplification of the lubrication problem and even eliminated in some instances. The rolling coefficients are shown in table

The recirculating roller bearing in figure 4 is the most recent development in the bearing field to eliminate sliding friction.

The recirculating roller bearing that is shown in Fig. 4 is also shown in the drawing of figure 5. The purpose of figure 4 is to show the modern methods of machine tool design in changing from sliding to rolling friction.

The coefficient of friction of roller bearings decreases with increase of load and with increase of temperature.

Friction should be reduced so as to reduce wear, stick-slip or stiction, power requirements, leadscrew torsional windup, position control, reduce heat, etc. The many ways to reduce friction could well take up a sizable book. It has been estimated that half the world's energy supply is consumed by boundary friction. We thought the topic of sufficient importance to merit these words.

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- by John K. Venard
 John Wiley & Sons, Inc., New York.
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TABLE 2-Rolling Coefficients

Annealed steel rolling on annealed steel	0.02
Hardened steel rolling on hardened steel	0.003 -0.004
Cast-iron or steel rolling on wood	0.10
Ball bearings	0.0008-0.0012
Roller bearings	0.0020-0.0040



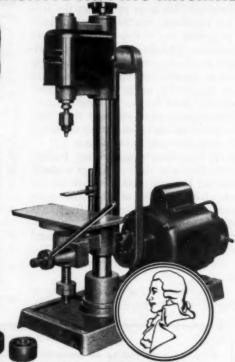
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PROCESS ENGINEERING



WHO BENEFITS FROM GOOD PROCESS ENGINEERING?

■ The process engineer is in a position to perform services for many areas. The following functions depend on him to perform their jobs; they depend on him to the extent that if he fails them in some aspect of his job he can cripple a vital department in the organization.

Management—Top management depends on him to equip the plant with the most economical process, so that competition can be met and the company can receive a good return on their investment.

Product Engineering—Is the product designed for economical manufacturing techniques? Product engineering people turn to him for the answer.

Finance—Short and long range planning advice is sought so that monies can be set aside to finance changes in products and improvements can be programmed for the most economical period.

Purchasing—These departments go to him for target prices to make sure they are buying at a fair price, and for accurate specifications for tools and equipment.

Sourcing-Planning sourcing people ask him for estimates to determine "make or buy" decisions.

Maintenance-For chronic maintenance problems, these people seek solutions and redesigns.

Production Department—This is the most important area he serves. Whether his work is good or bad, the

men on the production line must live with the process he specifies for the job. Incidentally, these men are usually the best source for an evaluation of his work.

Supplier—The suppliers of machines, equipment and materials depend on him for the specifications, designs, technical information on jobs to be done. Usually the needs for new processes are carried to the supplier through the process engineer.

Personnel Dept.—Personnel men often call on the process engineer to help them plan rearrangements needed to settle labor disputes. Safety problems are often corrected by the efforts of the process engineer.

The size of the company and the products manufactured by a company govern the status of a process engineer. In a small operation the owner of the plant may do his own processing; or he may depend upon outside professional service. In some small operations, process engineering is a part time job shared with other engineering duties. In a large industrial firm there is usually a department devoting full time to processing; and these departments are split into sections such as tool engineering, plant layout, industrial engineering, tool research, process development, etc.

There are three critical periods when the process engineer must give management guidance:

1. Long range planning costs are estimated by the process engineer and these costs are used to determine if and when the company should and can put a new product into production. The phasing out of old products and the introduction of new

products is governed by the way the process engineer plans his work and follows his equipment through its development stages.

2. New tooling is the responsibility of the process engineer. After the plans are laid, he must see that the tools and equipment are specified, designed, constructed, installed, "debugged", and released to production. 3. Improving Existing Processes-No matter how good a job is done on the drawing boards, it always looks different after it is constructed. The energetic and alert process engineer will be constantly on the lookout for ways to improve existing processes. It is discouraging to have spent considerable money on a new process and then have it turn out to be more

methods of doing the job.

The process engineer should always keep in mind that he can provide a service to other functions in his plant. He should follow well laid plans so that management knows what is in store for them.

costly than old existing methods, but

there are usually ways to improve all

processes if you seek out alternate

The process engineer's job almost always starts with a released product drawing; however, there are some firms that require that all product drawings be approved by manufacturing engineering before they are released by product engineering. Regardless of when the process engineer reviews the product drawing, management expects him to estimate the costs of facilities, equipment, tools, dies and gages to produce the product. This estimate should be submitted showing alternate plans with a recommendation

on which plan you, as a process engineer, think should be followed.

Alternate plans can be made by making one estimate with the idea of "making do" with the present facilities and equipment, and another estimate of completely new facilities and equipment. If you look at both extremes, you can easily decide which one will give you the best return. A possible compromise between the two may be the best solution. Submitting the alternate estimates is important because management might see advantages in the alternate plans that you do not recognize.

An estimate is not complete unless it shows time factors. This can be done by using phasing charts showing design time, construction time, and de velopment or "debugging" time. Management is always concerned with how long it will take to get the product into operation. If the estimate is a cost reduction item, the time phasing is very important because the savings must be made before the product goes out

When management appropriates funds and gives the process engineer the green light to procure equipment, the estimate becomes his road map. The estimate was used by management to determine if a new product should be produced. It is the responsibility of the process engineer to follow the spirit of the estimate and stay within the costs. This does not mean he should not consider a change. However, any such change should be brought to management's attention for a decision.

Management relies heavily on the judgment of the process engineer. Every effort should be made to gain management's confidence.



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THE PRACTICAL DIEMAKER



PLAN FOR TRAINING FUTURE DIEMAKERS NOW!

■ A die in an automatic press operation is a competitive tool any place in the world. It is a great cost equalizer because in operation labor becomes minuscule. The essential factor of cost reduction in die making is the role played by the tool and diemaker. Dies that are built inherently sound justify their cost over and over again. However, dies that do incorporate basic proven principles can be very costly. The crux of the problem is the dwindling supply of properly trained tool and diemakers.

A well trained diemaker is a resourceful individual; in most instances he can adapt himself to model-making for research and development projects, to trouble-shooting for various manufacturing departments, to processing and tool engineering. Diemaking, if practiced in its highest and most exacting form, is a noble trade bordering on pro-

fessional status.

Today there is a shortage of diemakers. The shortage of really good diemakers is at the critical stage. In recent years the Department of Labor has become concerned over this shortage and how it can hurt our defense program.

What has brought about this situation? Here are some

of the more obvious reasons:

 The best age group for diemakers (at least 15 years experience) includes a minimum of craftsmen because of the dearth of training during the depression years and then the World War II years.

- 2. The benefits and rewards to young men who enter the field of diemaking have not been publicized. It is quite understandable for a boy to know that the house he lives in is made by carpenters, bricklayers and other craftsmen. However, he is not as familiar with all that is involved in the construction of the car he drives or the lawnmower he is supposed to use; these products are manufactured in a factory. That a diemaker made the dies and tools to make the stampings that became the fender of the car he is driving just doesn't occur to him.
- 3. Vocational guidance counselors at the secondary school level have not done a satisfactory job of advising mechanically inclined students about the scope and opportunities in diemaking. Too many of these vocational counselors have never even walked through a die shop.
- 4. The Department of Labor, in past years, failed to acknowledge the crisis. More recently, however, they have shown some concern and have surveyed the problem. The statistics they have compiled point to disaster if we do not take action immediately to alleviate the situation.

One indication of the shortage of good diemakers is the ads in the classified sections of our daily newspapers. Industry will not solve the problem by appointing a fact finding committee. It can be solved only by those men who have control over their tool and die rooms in captive shops and the owners of tool and die shops. These are the men who can control the future supply of good tool and diemakers. Once the decision is made to do something about it, the logical procedure is to institute proper apprenticeship training as soon as possible.

An effective apprenticeship program for training tool and diemakers, in my opinion, is the arrangement between the Chicago Vocation School System and the Tool and Die Institute of Chicago. In this cooperative venture, the apprentice from a member shop attends evening classes twice a week to learn the theory of diemaking; during the day he applies himself to actual shop work. Other metropolitan areas can do the same thing. An inplant training program can be slanted to meet the needs of a particular company.

The 4-year training program of the Chicagoland tool and die shops has been in the process of development and refinement over a 10-year span. In future issues I intend to discuss this program which was designed by practical men, for practical men to train apprentice tool and diemakers.

Everyday we hear and read about the shortage of engineers, even though colleges are training thousands of them. But who is training our future tool and diemakers? Only you can do this.

"The progressive die of today, even though fully automated, will not suffice for tomorrow's demands on industry. A complete metal stamping will not be enough!" —Paul Prikos "Endless Belt Feeding to a Progressive Die" MTBB, Dec., '58

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☐ Send a small sample of Lan-O-Kleen PLUS.

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September, 1959



CUTTING TOOLS



INCREASE THE METAL REMOVAL RATE

■ Did you ever wonder how a competitor could make a product comparable to yours in quality and performance and yet do it at lower cost? Certainly most, if not all, of the components in his product have to be produced at less cost if the final assembly is to be lower in cost.

If it can be assumed that the labor and material costs for each of these two manufacturers are nearly the same, then the only area in which a savings can be anticipated is in the production rate. Pieces per man-machine-hour determines the cost. Cost in turn determines the selling price, the business volume and ultimately the profit. It is readily evident, therefore, that if greater production per man-machine-hour can be achieved, profits will improve.

Increased production immediately suggests such factors as; better tooling, acceptable materials with better machining characteristics, a new machine tool, a design change, even changing from a machined part to a stamping or die casting. All of these considerations and others have much merit, but in many instances none of them are applicable. Without trying to be facetious, I propose a rather elementary solution: increase the metal removal rate. Do it by increasing the surface foot rate, the feed, or taking one cut instead of two or three.

If the speed is doubled the cutting time is cut in

half. If the machining time equals the handling time, this means an improvement in production of 25%. For example, 10 more pieces are obtained on an operation that is producing 40 pieces per man-machine-hour. At 80% operator efficiency it represents at least 64 more pieces.

Certainly this will require more power. But the increase in cost would be less than \$1.75 per 8-hour shift if the speed were doubled on a 25

hp machine.

The hourly rate of the operator and the amortization schedule of the machine tool are not involved. One element remains—tool life! This will be lowered. More cutting edges will be required! This will cost more! In fact, the tool—more specifically the cutting edge—may not last an hour.

In one specific case, four cutting edges had been required to produce eight pieces per shift. As each cutting edge cost 28 cents, the production of eight pieces per shift involved a tool cost of \$1.12. The machine and operator rate was \$9.00 per hour. This brought the total machining cost of eight pieces to \$73.12, or \$9.14

per piece.

Using the same throw-away inserttype tooling but increasing the cutting speed and the feed, the number of cutting edges required per shift was increased to 24, resulting in a tool cost of \$6.16. The machine operator cost per shift remained the same, but because of the greater number of cutting edges required the total cost under these new operating conditions was \$78.16. But as 16 pieces were produced, the cost per piece was reduced to \$4.88 or a savings of \$4.26. For the entire shift, a savings of \$34.08 was effected.

The time required for changing and reconditioning tools was formerly a significant factor. This is no longer true. The mechanically-held, indexable throw-away insert type tool provides a technique that makes tool changing one of the least significant factors in the metal cutting operation. Tool changes which once required as much as 30 minutes, including reconditioning, can be made in one or two minutes. The ratio of operating time to tool change time has been increased to values frequently exceeding 100 to 1.

Tool life now should be considered with respect to economics. If 10 cutting edges per shift will produce a part more economically than two cutting edges per shift, there obviously is no reason for not following this

procedure.

You are not really interested in tool life in your shop—what you really want to know is how much it costs to produce each piece. The key to more production and lower costs is efficient tool usage. Arbitrarily fixed tool life in minutes is a mythical standard that has validity only when interpreted in dollars. Usually, throwaway insert cutting edges produce economies when consumed—not when preserved.

In many plants an invisible door remains closed on carbide. This door is symbolic of the philosophy that, "we can't afford to operate at these speeds and feeds—carbide tooling costs too much—we must use carbide edges

sparingly".



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LEADERS OF THOUGHT IN INDUSTRY



WALLY BRAINARD, Chief Engineer, Servo Division of Kearney & Trecker Corporation: "To decrease manufacturing costs you must eliminate all non-productive functions."

Kearney & Trecker scores with its revolutionary

"COMPLETELY INTEGRATED PROCESS" CONCEPT

An interview with William F. Schleicher

Q. Mr. Brainard, I've heard you have developed a new manufacturing concept. Our readers would like to learn something of the underlying philosophy which brought about this development, also the probable effect this will have on American Processing methods.

A. For years, some engineers and production executives have dreamed of a unit which would, literally, do everything: drill, ream, tap, bore, mill, without set-up time and without hauling the part from department to department. However, the obstacles were too enormous to make such a development possible. Instead, we have witnessed impressive improvements in the various types of machine tools such as drilling, milling, boring, etc. Yet, basically, all you have is the same system of manufacturing you've always had. You mill, unload and truck the part to the drill. Then you drill. Then you haul the part to another machine and do something else to it.

You're moving one part all over the shop and spending more time and money in hauling, setting up, loading and unloading and performing other costly and time consuming functions than in cutting metal.

- Q. There's no profit until metal is removed.
- A. Exactly! So we have been concerned for years with the idea of having one machine do all of the work and eliminate all this hauling, loading and unloading and setting up. In other words, develop control of complete processes and stop thinking of single function machines.
- Q. And by "complete processes" you mean . . .?
- A. Place the rough casting on the machine table, insert a numerical tape, push a button, and the machine mills, drills, reams counterbores, taps, and bores. Then remove it from the machine and in many instances you have a finished part.
- Q. Isn't this the theory of the special machine and the transfer machine?
- A. Yes, on volume production. But what about job lots with quantities of 10, 20, or 50 pieces which occur in intervals of from one week to six months? Those are the jobs with which this new concept is concerned. We're not interested in the transfer type machine as far as this concept is concerned. Transfer machines must process thousands of pieces to be profitable, and run those pieces more or less continuously. A plant operating on a job shop principle, which means

about 75% of all industry including aircraft, has no efficient method of finishing parts without hauling it all over the county.

Let's talk of this concept a little more. In the olden days, mother bought milk from a milk dealer, vegetables from a huckster, meat from the butcher, beans from the grocer, and bread from a bakery. Today, mother has one central source, the supermarket where, in addition, she buys aspirins, lipstick, magazines, household utensils and many more items. My concept is the same: a central, one stop, manufacturing operation, a completely integrated processing machine which takes a rough casting and transforms it into a finished piece.

- Q. It's interesting to think that Kearney & Trecker, a milling machine manufacturer, suddenly finds itself in the drilling and tapping business.
- A. Yes, that's true except for our transfer machines. When you develop a new concept you cannot do so without getting your feet wet in another man's puddle. If we had stuck to milling machines this concept would not have been born. I think that machine tool builders should not be limited by the products which they make, but should think in terms of combining other operations with their own.
- Q. Can you give us an example?
- A. Why shouldn't a lathe manufacturer, for instance, combine a lathe operation with a hardening operation and then with a grinding job, instead of hauling the piece all over the shop.

- Q. This would require a lathe manufacturer to get into the grinding and heat treating business?
- A. What's wrong with that? There are several builders now who make both milling machines and grinders. Another area where complete processing is applicable is in gear manufacturing. I see no reason why a bar can't be fed into a unit and a hardened and ground gear come out the other end.
- Q. This doesn't sound like an easy thing to do.
- A. It isn't easy if you begin by analyzing why it can't be done. And that's the problem with much of our manufacturing thinking today. We are like the salesman who starts each day with a recital of what he should tell his sales manager why he didn't make a sale that day. Of course, he doesn't sell anything. He's licked before he starts. Many machine builders are doing a terrific job of perfecting their machines. They're taking advantage of numerical control, optics, hydraulics and all new technical developments.
- Q. Why, then, do other machine tool builders not accept new concepts, or to use your phrase, embrace the idea of a completely controlled process?
- A. To do that you need three things: first, capability to conceive, design and build the unit; second, a sales force able to convince customers that a new era has dawned; third, money and just plain, old-fashioned guts to spend several years or more in development and research work. The builders have the engineering, of that there is no doubt. I cannot speak for



"I have always been appalled at the amount of time and money going down the drain by hauling work from department to department."



"Machine tool builders ... should think in terms of combining other operations with their own."



"We are shipping at a rate of better than one machine a week,"

their sales force because I know little of that phase of the business. As for the last, money and courage, those are, I am afraid, the real stumbling blocks. Money is always tight for machine tool builders, although they probably could raise it. As for the courage, there is a big rub. So many people have too many reasons why a thing won't work.

Q. How long have you had the idea of this concept?

A. A good many years. I was particularly conscious of it during the war when I was involved in the engineering and manufacturing of the B-36 bomber. After the war, which I spent with the aircraft companies, I became more and more appalled at the amount of idle time and the amount of good money going down the drain by hauling stuff around from department to department.

Q. Why wasn't something done years ago?

A. We didn't know how to setup automatically. Such a concept could have been developed years ago but to what purpose? You'd still have to set up every tool and every tool movement and do all this by hand or press into service all kinds of complicated linkages, cams and other mechanical devices, which would have made it an expensive, complicated Rube Goldberg which wouldn't have been profitable to operate.

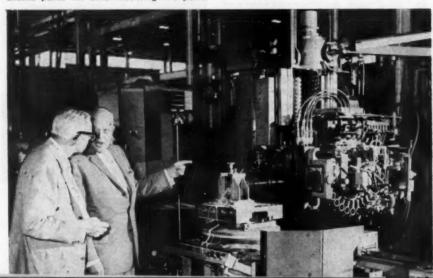
Q. What brought about a break through?

A. Numerical control. With this method you are able to transmit your ideas to tape and then dictate to the machine what it should do. Numerical control opened up the frontiers to this, and other new concepts in manufacturing.

Q. What of the future of numerical control?

A. The shop which doesn't have it will have rough going.

"This is the new concept. Place a rough casting on the table and remove a finished part. Incidentally, the model does not have the shuttle pallet for accommodating two parts."



Q. When do you think this will be?

A. The breakthrough in a practical sense is here today. Full scale use could take five years or ten years. It's hard to say. But this is true: If a shop, whose parts are manufactured on a job basis, is not well equipped with numerical control machines, he will lose the competitive battle. He'll not be able to compete with the shop which does have numerical control.

Q. Is your viewpoint possibly a little optimistic?

A. Not at all. You were with me at G-E's LST-G facility showing us how they had installed almost 5 million dollars worth of numerically controlled machine tools. With numerical control they expect to pay off the cost of equipment in short time. Definitely, numerical control is a must in the future of any plant.

Q. Can you describe the Milwaukee-Matic, which examplifies your concept, briefly for us, Mr. Brainard?

A. First, I think we should amplify one aspect of our discussion, that which relates to this new concept. While it is true that the machine eliminates the problem of hauling work from department to department, there are other important advantages which should be explained. The basic strategy is to keep inventory to a minimum; i.e. producing parts only as they are needed. We reduce shelf inventory and in-process inventory. If you need five parts this week that's



"These are the rings on the pre-set tools. The spacing of the rings identifies the tool required for the next operation,"

all you make, if you need five parts next month you merely place the tape in the machine and you have your five parts again. There's tremendous saving in tooling. One setup generally takes care of milling, boring, drilling and tapping, etc. You can change from one part to another in a matter of seconds. For example: two different tapes can be placed into the machine. One tape works on one part, while a different unrelated part is being set up on the pallet shuttle. When the first part is finished the shuttle presents the second, and different part, to the machine. The second tape takes over and makes an entirely different part.

Actual metal cutting consumes nearly 90% of the time of the machine. That's a great deal more than you get from standard machines.

But to get a brief description of the machine: a numerical tape control system makes the entire machine automatic. The control system directs

Your editor spent quite a bit of time with Mr. Brainard at the occasion of G-E's press preview of their Large Steam Turbine-Generator plant. A report on this plant appeared in the August issue of MACHINE and TOOL BLUE BOOK.

LEADERS OF THOUGHT continued

positioning of the work table and three-axis spindle, controls tool selection, tool changing, spindle speed, feed rate, turns coolant on and off, and shuttles the work-pallet between index table and load and unload stations.

Q. Where are the tools located?

A. They are located in rotary maga-



Tooling cost on this switchbox totalled \$600. The total cycle took 22.8 minutes. Milwaukeematic operations included 11 milling, 1 boring, 11 counterdrilling, 24 drilling, 1 counterboring, 11 countersinking, 1 reaming, 1 back face, and 12 tapping. With conventional method the tooling cost was \$2,000; total cycle 27 minutes; set-up per lot took 3.7 hours. No. moves was 13.



This part was previously made with limited (\$200) tooling and required 200 hours. Milwaukee-Matic time is 1.5 hours; tooling cost came to \$1.600.

zine to the right of the machine spindle.

Q. How do you select the proper tools?

A. Every tool has a different combination of rings on the shank representing a tool number. The tape is punched with that number. When a certain set of holes pop up in the tape, the tool magazine begins to rotate until these same holes match up with the proper ring combination on the tools.

Q. How many tools can you accommodate at one time?

A. We can accommodate 30 tools at one time; plus one in the spindle; however, with the ingenious coded tool holder we can provide 961 different tool combinations.

Q. How is the tool transferred from magazine to spindle?

A. When told to do so (by the tape.), an arm with two opposed "hands" comes out. It grasps the tool in the spindle with one hand and the proper tool in the magazine with the other and merely switches the tools around.

Q. Tool selection is then completely automatic?

A. Yes. In addition, feeds and speeds are also automatically controlled by the tape. We've made the machine almost 100% automatic. You must still load the tape, load the workpiece and push the button. However, production time is not lost while this is accomplished.

Q. Maybe you can get a tape to do those things too.

A. We can have the tape push the button.

Tooling with tape



This drill jig: \$280.00



This drill jig: \$4.20

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BOOK

113



"How can we squeeze 21/2¢ out of production costs?"

Questions like this are nothing new to Ryerson specialists.

With their broad experience in steel applications, they can often suggest ways to save-a different type or analysis, steel in ready-touse form, or an improvement in fabrication methods that will shave a few pennies off the final unit cost without impairing quality.

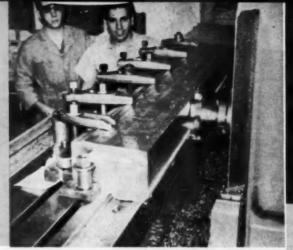
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MACHINE and TOOL BLUE BOOK



1. The 600 lb. forging set up for chipmaking.

MILLING A WORK HARDENING FORGING

by **Horace Frommelt**, Director Spring Garden Institute Metal Removal Center

teel

OOK

High sfm rates are necessary, but the material tends to "snake" under heavy cutting pressure

■ A forging to be made into a mandrel for a nuclear reactor got kicked around by several shops and was returned as "impossible to machine!" The material: Jessop No. 9.

The specification for this mandrel is based upon its four-fold greater coefficient of expansion as compared with traditional steels. The result is a forging, weighing some 600 lbs., high in manganese, nickel and chrome. The chemical composition is 0.38 C, 11.40 Mn, 0.037 P, 0.008 S, 0.56 Si, 3.34 Ni, 4.24 Cr, 0.50 Mo.

Some 300 lbs. of metal has to be removed-econ-

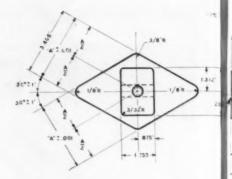
omically, if possible.

The first attempts merely resulted in work hardening of the surface with almost immediate elimination of anything like a good cutting edge—perhaps it would finally wind up as a grinding operation of eternal duration. Urgency demanded a reasonably quick and effective technique of making 300 lbs. of chips from a forging that is 5" x 8" x 50½" and is innocent in its appearance before subjected to chip making. See Fig. 1.

The machining difficulties, such as work hardening, was one problem. The tolerances as shown in the print, Fig. 2, was another major concern, once the nature of the material made itself known after the first machining or milling passes. How could the work hardening characteristics of the material, that make it a close relative of the 300 stainless series, be overcome? There must be proper application of carbide speeds and feeds. But there was also the "rubbery" characteristic of this material that causes it to snake under cutting pressures.

Hogging off phases could be executed best at relatively high surface foot rates and reasonably heavy chip thickness. The 50 hp Milwaukee miller has plenty of power for these rough and ready cuts. But even here it was impossible to subject the forging to more than 25 hp loads without extreme distortion—so much so that "warping" is a more suitable term.

The original surface foot rates tried with planing were entirely inadequate; sfm rates hovering in the 100 range make every cutting edge appear not



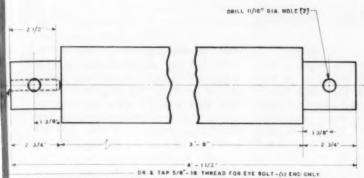
2. Sizing and annealing mandrel for nuclear

only inadequate but slightly ridiculous. Moreover, the surface of the workpiece after such attempts is glass hard, so that it defies cutting edge penetration.

Operating Characteristics

The 6" diameter VR face mill with 7 stations is equipped for indexable square carbide (or ceramic) cutting elements, available either in negative or positive rake cutting angles. At 230 revolutions per minute the sfm is approximately 350. The chip thickness of .015" seems essential for reasons that will be discussed immediately. Under these conditions the inches per minute feed is 35. Depths up to .200" were taken successfully from a cutting standpoint but had to be abandoned when the cutting was close to the final dimensions.

At this point the "k" factor, or hp



reactor which posed several problems because of nature of material and tolerances.

per cubic inch per minute for this material that is under 180 Bhn, is approximately 1, if the cutting action is reasonably good. If not, the k factor increases considerably, due largely to the effect of the work hardening upon edge penetration. While the edge holds up under this kind of illogical cutting the k factor is well over 2, *i.e.*, it requires more than 2 hp per cubic inch per minute of metal removed.

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Experience with the 300 stainless series, both single and multi-tooth machining, provides the following basis for rationalizing the action of chip removal: At sfm rates under 225 on roughing cuts and 350 to 450 on the lighter cuts, work hardening is able to keep in step with chip removal. Time is an essential element in work hardening, because the heat of work requires time to produce its effects on or in a thin layer of the component. Any rate of machining therefore, that is synchronized with, or worse still, behind this ogre of work hardening, makes machining well nigh impossible. This, indeed, happened on this job. The sfm rates tried out prior to the milling of operation here discussed, in the range of 100, made it appear that this Jessop No. 9 material was impossible to machine with chip making techniques.

It is when the rates are sufficiently high to "keep ahead" of this work hardening effect that chip making procedures are reasonably successful. The Jessop No. 9 specification for this component, in this regard, is a close relation to the stainless materials, particularly the 300 series. It was our experience with this stainless material which paved the way for successful machining of this nuclear reactor mandrel.

Sequence of Operations

From the 5" by 8" forging, the 5" dimension was brought down close to 3.406" by milling both sides. At this stage the workpiece looks about as shown in Fig. 3. A set of accurate fixtures were then designed and produced for the holding of the work as shown in Fig. 5. The first stage of this second operation (after the reduction of the 5" dimension to 3.416") is presented in Fig. 4. At this point the work rests securely against the angle cradle; when the

first step in the diamond shaping has been completed the workpiece then rests in the cradle as shown in Fig. 5. (See Fig. 6 also for cradle fixture design) End stops and additional right angle supports are used, the latter during the final diamond-shaping phase of the operation. The completed piece and one of the "cradles" is shown in Fig. 6.

The more interesting and significant aspects of this job are obviously bound up in operating characteristics-speed, feed and chip thickness-as well as tool geometry. As indicated, relatively high surface foot rates must be specified for these work hardening materials. Some compromising in this instance was necessary in the face of the tendency of the forging to "snake" under heavy cutting pressures. Thus, instead of 450 to 550 sfm rates previously determined as effective on the 300 stainless serieshigher rates, by as much as 11/2 and 2 times, are advisable under certain conditions—it was necessary to keep the sfm rates around 350. This lowered rate of edge entrance at no time permitted the work hardening to keep up with, much less get ahead of, the rate of chip making. Edge life was therefore in every good shop sense reasonable. The roughing cuts were taken with wear lands that finally measured as high as .060" to .070". The horse power demands did not rise significantly after a .030" land was reached. Better than 1.000 cubic inches of this high manganese (also nickel and chrome) material was removed with four sets of cutting edges.

Tool Geometry

Should the cast iron cutting grades (tungsten carbide such as are represented by VR's 2A5, Carboloy's 283 and Kennametal's K6) be used in conjunction with positive angles or at least a combination of zero and 5° or 7° top and back rake angles? This is a nice problem in economics rather than metal removal, and remains for definitive investigation over a long series of tests under controlled conditions. The answer from the chip making activities on this and other similar pieces of work hardening components, particularly the 300 stainless, is no. The final answer will come only after much more work has been done. The writer's opinion is that the economics are against the tungsten carbide grades plus positive angles.

The positive angles permit but four indexings with the square precision ground bits or blanks; the negative angles double that number. Hence, to get back the relatively modest investment in cutting elements, the straight tungsten carbide grades plus positive angles must yield twice as many pounds of chips as the combination of carbide blanks with negative angles. The evidence thus far is entirely and wholly against the former; these materials should be machined (in this instance milled) with negative cutting angles. Five-five negative combination is built into the VR face mill. It proved entirely adequate.

What of the grade of carbide in conjunction with the negative angle specification? There is little to choose from if a deduction is made based on this and similar experiences. Thus VR 75 gave comparable results to 2A5 when both were specified in union with negative angles. There may be an edge in favor of the cast iron cutting grades in the lighter cuts; the steel cutting specification in the carbide cutting element in the heavier and roughing cuts—at least in this mandrel job—came up with more favorable overall end results.

The tendency for this material specification to "snake" under heavy cuting pressures—and it is pronounced in this Jessop No. 9.—made it necessary to alter the final operating characteristics slightly. The amount of material left for grinding was increased to .025" on a side instead of .010" overall as originally set down. With depths less than .100", or approximately .075", and at sfm rates

- 3. Forging has been milled on two sides and is set up for next stage.
- First stage of second operation is nearly completed. Note the angle cradle fixture.
- 5. First stage of diamondshaping has been completed in this view.

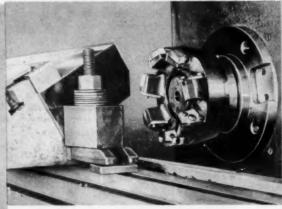


Fig. 3

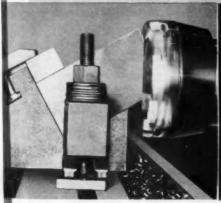


Fig. 4

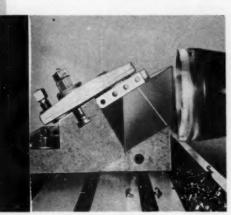


Fig. 5

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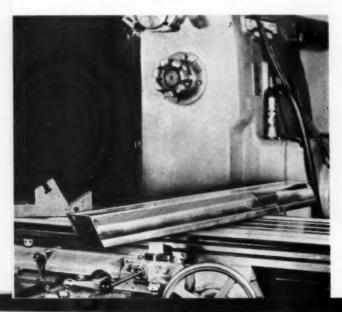
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as high as 1,000, but never under 750, and chip thicknesses under .005" this "snaking" could be controlled if not eliminated.

In summary, the most important operating characteristic when machining these work hardening materials is a high surface foot rate in conjunction with carbide cutting elements. High here must be interpreted well up to 500 sfm for the moderately heavy cuts and higher for the lighter. Previous experience with the turning of a stainless 300 series hex bar (304) cuts as deep as 7/16" proved successful under shop operating conditions at sfm rates as high as 450. Whatever the conditions confronting the metal removal specialist, compromises with sfm rates can never proceed to the point where the work hardening keeps up with, not to say races ahead of, the edge penetrations.

Secondly, the currently touted combination of straight tungsten carbide grades with positive angles is seriously to be questioned, not from a metal removal technique standpoint, but from the overall results which must inevitably include the economics of machining. To throw away 50 cents of every dollar invested in carbide precision ground indexable blades by using positive angles calls for an edge wear of double that for the tungstentitanium carbide grades plus negative angles. The evidence up to this point is in favor of the latter, or at least in favor of using negative angles with either the so called straight tungsten carbide or the tungsten titanium carbide grades. The latter aspect of the specification does not seem critical. In the nuclear reactor mandrel the results favor the tungsten titanium carbide grades plus negative angles.



6. Completed mandrel. Cradle is shown at left.

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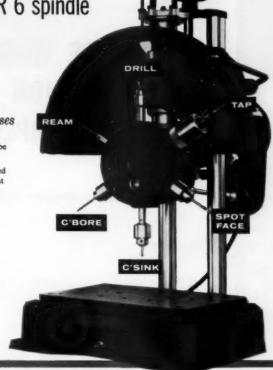
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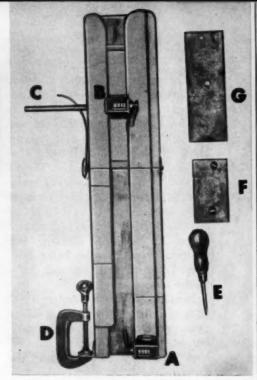
One reason a program fizzles: too heavy on theory, not

By Harold R. Nissley, Consulting Engineer

■ Many work simplification programs peter out before their scheduled ending because of too much "theory" and not enough practical demonstrations. To overcome the theoretical tedium that frequently develops, many "work simp" teachers make liberal use of the 30-hole peg board, before-and-after movies, and other down-to-earth examples and aids. Each session should contain at least one convincing and practical demonstration.

In both light assembly and machine-loading work the question frequently comes up: "How much time do you actually save by shortening the distance 50%?" If the teacher answers: "That depends on a number of variables," he loses half of his audience; after all, he has been hammering away at shortening distances as one of his many time-savers. If he is an informed teacher, he will *not* say that a 50% reduction in distance will reduce the time 50% unless the distance is considerable (upwards of 10 feet). The inertia of the part must be overcome; the inertia of an

Practical Arbitration,
Time Study and
Work Simplification
Part IX of a Series



enough practical demonstrations

operator's arm (which weighs around 8 pounds) must be overcome both at the start and at the finish of a part movement.

You could answer such a question by referring to one of several predetermined time tables. Too frequently, however, some cantankerous person will say: "Prove it." If you want to lose the whole class just answer this challenge with: "The book says so." Proof is needed.

A simple device can be used effectively to demonstrate the relationship between distance and time and weight and time.

The illustration depicts a "homemade" device for demonstrating to everyone's satisfaction the relationWEIGHT-DISTANCE-TIME MEASURING DEVICE is used to demonstrate the relative changes in time required to move objects, five to twenty inches by hand. Items A and B are counters (A is fixed, B is movable). Item C is a dowel that locks the movable counter (B) at 5-inch distances from A (picture shows B as 15 inches from A). Item D is a 3-inch C clamp to clamp the device, vertically, to table top. Item E is a 2-ounce weight (a screwdriver substituting for a weight). Item F is a 10-ounce weight: Item G is a 20-ounce weight. Items F and G are screwed together to produce a 30-ounce weight. With one of these weights palmed in the hand, the hand passes quickly from one counter to another until 50 round-trips have been made; a stop watch reading will then give the time for 100 starts and stops at given distance intervals (and for different weights moved).

WORK SIMPLIFICATION continued

ship between (a) distance and time in moving light objects short distances and (b) weight and time in moving light objects short distances.

The device consists of a wooden chassis 22 inches long by 4½ inches wide. Within this chassis (hinged at the middle to facilitate transporting it) is a wooden carriage which can be moved and locked at 5-inch intervals. Item C is a pointed dowel to lock this carriage into position after its side holes have been lined up with the side holes in the chassis.

Items A and B are counters. Over each counter arm is a spring which gives greater flexibility to the striking action when the fast moving hand or finger hits it during the experiment.

Item D is a three-inch C clamp that is used to clamp the device in a vertical position on a table or bench. Thus, horizontal results can be compared with vertical results.

Item E is a 2-ounce screw driver. It was selected mainly because it

weighs only 2 ounces—the lower limit of our weight-moving experiment. Item F is a 10-ounce piece of cold rolled steel. Item G is a 20 ounce piece of cold rolled steel. Items F and G may be attached together with two round headed bolts, thus providing the upper weight limit of the experiment (30 ounces). Not shown is a stop watch which is used in timing.

How the Device Works

The two ounce object (E) is grasped in the right hand. The wooden carriage is moved to the 5-inch position (in the picture it is shown at the 15-inch position i.e., counter B is 15 inches away from counter A). Then, with the 2-ounce weight firmly palmed, the index finger moves (with the hand) rapidly back and forth between the counter arms (springs). As soon as either counter reads 50 the stop watch reading is noted. This watch reading is divided by 100 to get the relative time taken to move a 2-ounce object 5 inches from one



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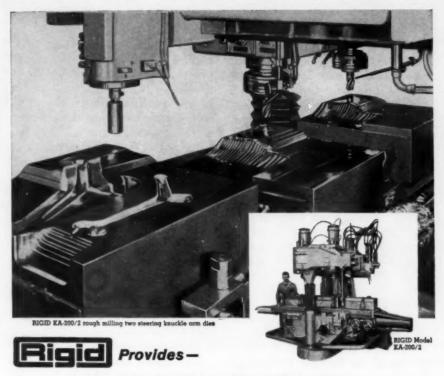
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fixed position to another fixed position (the reversal in direction at the end of each pass down the chassis approximates a fixed position).

Because only relative times are of interest in this experiment, some safeguard must be established that will insure a constant skill and effort on the part of the subject throughout the experiment.

This safeguard is achieved, largely, through the maximum speed effort the subject is urged to maintain throughout the experiment. Thus the need for "speed rating" the various trials by the same subject is eliminated or

greatly minimized.

The 50 round trip experiment is repeated several times until the results become fairly constant. When the results do become fairly constant, the carriage should be moved to the 20-inch position at the other end of the chassis and the experiment repeated by the same subject. (This reduces the variables in the experiment) Thus the 5-inch and the 20-inch experiments set the anchor points for intermediate distances. But for the skeptic that does not believe that intermediate distances will not yield time values along the line connecting the 5-inch point and the 20-inch point, there are the 10-inch and the 15-inch stops that will enable him to prove or disprove this theory.

The 5-inch and the 20-inch experiments are repeated with each

of the remaining weights, 10, 20, and 30 ounces. The whole series of experiments may be repeated, using the device in a vertical position (or in any position that more nearly corresponds to the motion pattern of the operator's arm as it moves light parts short distances).

This device is simple to use and results are simple to

interpret.

This experiment can be conducted by as few as one person—if that person can read a decimal minute stop watch at a glance at the end of a 50-trip cycle. The device is rugged (it can be dropped onto the floor without much damage, if any); it is highly portable (total weight is 6 pounds—including the 32 ounces of weights used

in the experiment).

This device could put an end to many arguments about distances and weights in methods changes despite its limitation of relative time values. There is no patent on this one; make one for your own use. If you see defects in the one shown in this article, make a better one to suit your own needs. This device and others like it can stimulate interest and confidence in your work simplification program.

(Author's note: The writer will be glad to send anyone his results of experiments conducted using this device. Address your inquiries to: Editor, MACHINE & TOOL BLUE

BOOK, Wheaton, Illinois.)

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Electronic parts courtesy Judson Mfg. Co., Inc., Cornwells Heights, Pa.

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■ Magnetic chucks can be a versatile and effective clamping device when applied properly. The electromagnet provides the tool engineer with control of magnetic forces and fewer limitations in his fixture design.

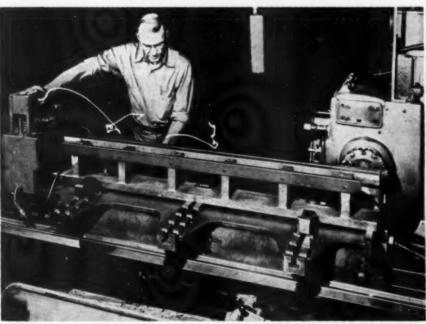
The saving of time and effort by the machine operator is an important factor today to maintain a high level of productivity. Figures 1 and 2 exemplify this. Other benefits derived from magnetic holding are improved cutter life and an increase in speeds and feeds. The user of the milling machine illustrated in Fig. 3 reports these benefits.

When a piece part is clamped by magnetic force, theoretically every molecule of ferrous material throughout the workpiece is influenced by magnetism. The holding forces are uniformly distributed throughout the piece part. This uniform distribution means less vibration in the part, thereby sharply reducing "chatter" as compared to non-uniform or intermittent holding by clamps. This results in improved cutter life.

To take further advantage of the magnetic holding force, arrangements should be to take the thrust from the table feed and the cutter against a mechanical stop which is not attached to the magnet frame. By arranging a fixture in this manner, it permits the magnet to function more



MOTION STUDY: loading and clamping a part with bolts and straps.
 Lights attached to operator's wrist trace motions as he clamps part.



2. MOTION STUDY: loading same part onto a magnetic milling fixture.

effectively as a registering device with a maximum of rigidity.

Small parts have always been a problem to hold satisfactorily on a magnet. This is due to the fact that holding power is proportional to the

mass of the piece part.

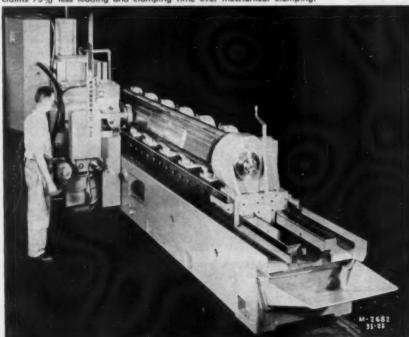
Figure 4 is a small part originally held in a vise which did not grip the part properly and frequently pinched the slotting cutter. Even though 23 percent of the total mass of the part was removed in this slotting cut, the parts were properly held and cutter life between sharpenings was improved.

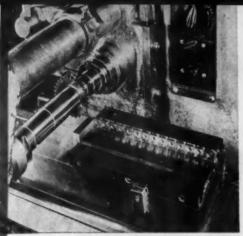
Milling keyways in various shaft sizes and holding them in magnetic vee fixtures is another application. In Fig. 5, the cutter and arbor have been removed to provide an unobstructed view of the complete fixture. In Figure 6 an unusual magnetic holding application for a part of thin section is shown. The part was 18 inches in diameter, turned all over, with two cored holes; the base of the stem was finished bored. The fixture was applied to a vertical milling machine, fitted with a rotary magnet, mounted on a standard index base. (See Fig. 6). The part was loaded over a pilot in the center and located radially from a pin into one of the holes. Production averaged 19 pieces per hour at 80-percent operator efficiency.

Initial cost of these examples of fixturing compares favorably with hydraulic or air clamping fixtures, but savings in operator effort, accuracy in production and improved tool life combine for definite economic advantage.

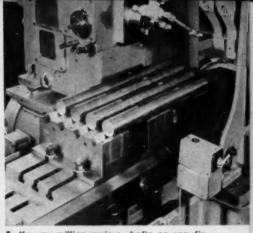
The above was abstracted from

3. 50 hp mill is equipped with heavy-duty trunnion fixture which includes a 12 ft. long magnetic chuck. Producer of heavy shear knives claims 75% less loading and clamping time over mechanical clamping.





4. Slotting 14 parts, each measuring 5/6"x5/6" on a special magnetic fixture. Slot is cut .090" wide and ½" deep. Feed rate: 13 ipm. Formerly part was held in vise which frequently pinched slotting cutter. Magnetic poles are arranged so that holding force is directed through one side and bottom surface of part and maximum of tractive force is achieved. Cutter life between sharpenings averaged 30,000 parts.



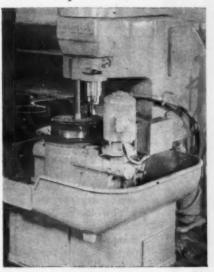
5. Keyway milling various shafts on vee fixtures attached to standard magnets wired in parallel. Operator lays shaft in vee and registers it against end stop mounted on machine table. Keyway cuts are made by climb milling with automatic rise and fall movement of head. Smaller diameter cutter can be used since no clearance over clamps is required. Shafts can be grouped closely together.

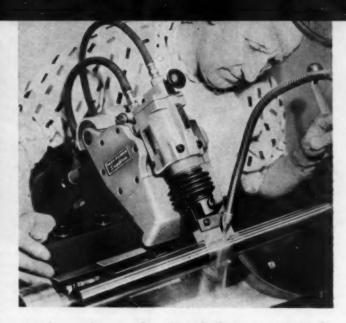
Frank L. Suchanek's paper, "Magnetic Holding Fixtures on Machine Tools," which he presented at the 23rd An-



6. Magnetic holding application for a thin section part which required 22 slots to be end milled around top surface of flange, Depth of the slots had to be within plus-minus .0005-in, with respect to bottom of flange. Fixture was applied to milling machine (right) fitted with rotary magnet, mounted on standard index base. Part was loaded over a pilot in center and located radially from a pin into one of the holes.

nual Machine Tool Electrification Forum sponsored by Westinghouse Electric Corp., Buffalo, N.Y.





Finish on this steel guide shaft is 1 microinch. The process is called . . .

MICROSTONING

■ An abrasive final finishing process, just introduced by Taft-Peirce Mfg. Co., generates a controlled microinch finish on practically any material; at the same time it corrects geometrical errors caused during previous machining operations.

Microstoning is accomplished by using a Supfina machine tool attachment. The microstoning attachments are most frequently used on engine lathes, although they are equally adaptable to vertical turret lathes, boring mills and

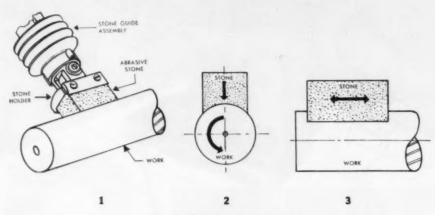
even planers.

This toolholder oscillates at its natural frequency by means of a pneumatic system that uses a minimum of compressed air. The mass inertia forces are almost completely self balanced, and with no mechanical force transmitting elements required, high oscillating frequencies are possible-from 2000 to 3000 per minute.

Most microstoning is done with vitrified bonded abrasive stones, using silicon carbide abrasive in grit sizes 300 to 1200. Coarser stones are available with aluminum oxide abrasives. The stones are soft enough to shape themselves to the workpiece. The initial grit size to use depends on the roughness of the work, the final one on finish desired.

The pressure between stone and part is usually kept between 20 and the sliding head or carriage should be made tight. However, spindles that run out or crooked ways apparently makes no difference. Reasonable control over work speed—20 to 300 sfpm -and a feed of .0200 to .1000-in per revolution is also desirable.

It is not necessary for grinding to precede microstoning. There are many applications, especially on unhardened workpieces, where size tolerances make it practical to go direct from turning to microstoning, even to a very fine finish.

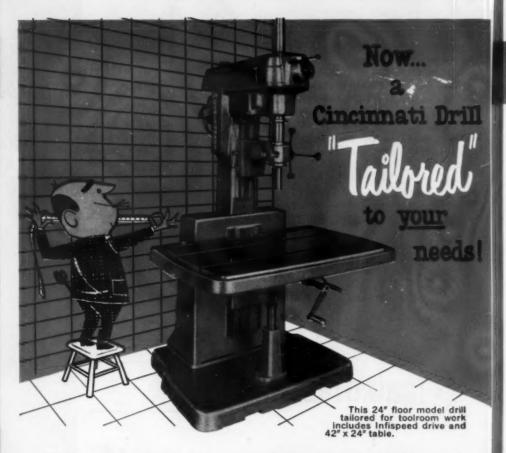


HOW MICROSTONING WORKS . . .

40 psi, but this is not critical. The usual surface speed for roughing is 50 sfpm; for finishing up to 400 sfpm. Attainable finish, of course, depends on the material involved. Using stones only, finishes to 0.5 microinches average can be obtained in hard materials, 1 to 2 microinches in the case of soft metals.

As for the requirements of a machine for mounting the Supfina unit, it is highly desirable that the gibs of

- Supfina Attachment mounts quickly on lathe tool post. Pressing pushbutton valve extends stone guide assembly, brings abrasive stone into contact with work.
- 2. Due to nature of bonding material, stone quickly conforms to shape of rotating workpiece. Constant downward pressure on stone maintains uniform abrading action and produces a controlled microinch surface finish.
- 3. As work rotates, stone is oscillated parallel to the work axis. Power feed of lathe carries the stone the full length of the work.



NEW BACK-GEAR SPINDLE DRIVE NEW PRECISION DEPTH STOP NEW BUILT-IN ELECTRICAL TAPPING ATTACHMENT INFISPEED VARIABLE SPEED DRIVE

OTHER COMBINATIONS

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field reports

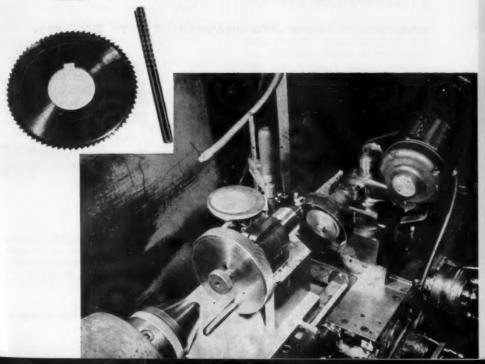
CLOSE TOLERANCES DICTATED THIS SET-UP

... for oscillator lead screw

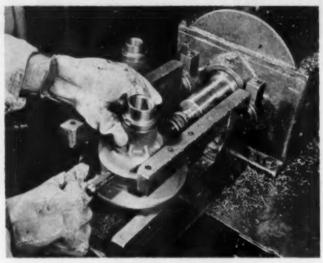
Collins Radio Company manufactures products that are used to serve a wide variety of communication functions. To achieve its quality production goal for a specialized component Collins engineers had to specify extremely close tolerances for an oscillator lead screw with

a one-eighth pitch thread.

Sufficiently close tolerances couldn't be held on any thread grinder in the shop. The illustration depicts the set-up that did the job. The lead screw from an Excello thread grinder was mounted on a Hardinge lathe. A Dumore head was also mounted with the cutter inclined at the correct angle. The part is then moved past the cutter.



FIELD REPORTS continued

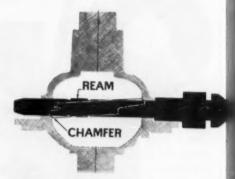


Operator loads Ford differential case into fixture guides for one-pass reaming and chamfering with a special Cogsdill tool.

ONE-PASS REAMING AND CHAMFERING CUTS TIME 65%



The Ford differential case and cover are joined and a slave pin hole drilled before hole finishing; this necessitates machining two hidden inside chamfers and reaming the entry hole, all from the exterior of the case.



The tool performs three operations. Reaming is done upon entry by four carbide-tipped reamer blades. When the tool is compressed against the part, the cam pin swings the double-ended, carbide-tipped blade out to chamfer both inside holes.

c b r e k

■ With a single tool, three-in-one operation, machining time has been cut 65% with a substantial increase in production at Ford's Sterling Township plant. A special deburring tool makes two hidden inside chamfers and performs ream operations on all Ford, Mercury, Edsel, Thunderbird and Ford Truck differential case assemblies. Running four machines, two shafts, Ford machines 8,000 differential cases a day. The tool was designed by Cogsdill Tool Products, Inc., of Oak Park, Michigan.

In a single pass, the tool reams the hole in the .750-in. entrance hole with an accuracy of +.001, -.000-in. Simultaneously, the tool makes two .045-in. inside chamfers at opposite ends of the differential case. The operation must be done in this manner because: (1) the case and cover are joined in a previous operation, necessitating chamfering internally from the outside of the case; and, (2) because a slave pin hole is drilled through the entrance hole requiring the burr removal.

Previously, three separate operations were necessary.

As the special deburring and reaming tool enters the case, four carbide-tipped reamer blades ream the hole. When the shoulder of the tool is compressed against the edge of the case, a cam pin swings out a double-ended, carbide-tipped blade to chamfer both inside holes.

The Cogsdill tool is used on a special Acar deburring machine, driven by a ½ hp. motor turning at 850 rpm. The fixture guides the differential case into the tool. The operator loads and in one easy motion the operation is completed. Tools are changed only after 5,000 to 6,000 differential cases have been run. • •



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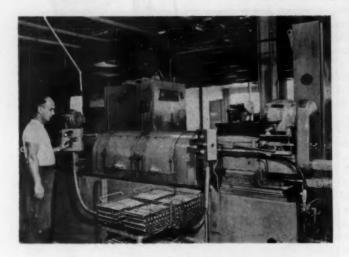
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GUNDRILLING POWER STEERING WORMS ON DOUBLE END MACHINE AT FORD

■ Automatic gun drilling of power steering worms at the Indianapolis plant of the Ford Motor Company, Transmission and Chassis Division, involves the drilling of a .412-.4218" diameter hole 6.01" through each worm. The hole must be held concentric with the O.D. of the part, within .010" total indicator reading.

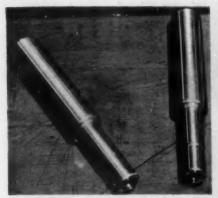
The double end machine, product of the Morris Machine Tool Company, Cincinnati, Ohio, speeds production by allowing the operator to conveniently process two parts simultaneously. Production rate is 64 parts per hour at 80% efficiency, with cycle time of 1.5 minutes.

The operator loads a part in the first fixture, hits the clamp button, then the cycle button, and an Air-Oil-

Matic unit begins drilling through the part. He then immediately repeats the loading and starting operation with the second part. The slight delay also facilitates unloading of the two parts. The 90 second time cycle is based on operating the gun drill spindles at 4700 rpm. or 350 sfm, feeding at the rate of .0015-in. per revolution. This time cycle allows six seconds for the operator to load and unload one part.

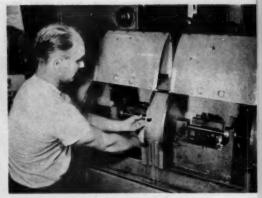
Prior to the gun drilling operation, the power steering worm of SAE 0.5120 steel is blanked out on a screw machine and centerless ground on its outer diameter.

In the Ford installation, the units are mounted on 6-inch sliding bases for adjustability of the entire drill system. Spindle speeds up to 8000



A .412-.4218" diameter hole is gun drilled 6.01" through each power steering worm at the Ford plant. Concentricity with the O.D. must be within .010" total indicator reading.

rpm. can be obtained with a simple adjustment, as can feeds up to 48 inches per minute.



The double-end machine utilizes separate selfcentering vee type fixtures for each gun drilling section. With cycle time of 90 seconds, six seconds is allowed for the operator to load and unload one part. Exact timing of the automatic operation provides for one section to be drilling at all times, since the operator can unload and load one section while the other is in action.

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CVA 3 JAW GEARED UNIVERSAL SCROLL

WITH AVERAGE GUARANTEED ACCURACY

OF .002" THREE INCHES FROM JAW FACE

other great features

ONE PIECE BODY
FLAME HARDENED JAW WAYS
INDUCTION HARDENED SCROLL FORM
COMPLETE WITH 2 SETS OF JAWS
AND CHUCK WRENCH

Size	Weight	Dia. of bore	Price*
91677	6 Lbs.	84"	\$34.00
372		1 12"	34.00
272.	6 Lbs.	1 12.	40.00
277	11 Lbs.	1 17 /1011	40.00
677	16 Lbs.	1-11/16	46.50 55.00
71/2	26 Lbs.	2-1/4	
9	38 Lbs.	2-3/4	70.00 86.00
101/2"	68 Lbs.	3-1/2	96.00
12"	106 Lbs.	3.7/0	115.00

*Prices t.o.b. warehouse, N.Y.C. Back plates available at extra cost. These are superior chucks produced by an English manufacturer famous for precision built machine tools and represent unbeatable values. A certificate is supplied with every chuck attesting to and guaranteeing its accuracy. All parts are guaranteed for a year against detective workmanship and materials. Repair parts available.

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Unretouched photos demonstrate "LO-TORK" Drill's chip breaking effectiveness. Conventional drill at left; "LO-TORK" at right. Same workpiece in each photo.

EVER!

a chip breaking
drill that actually
improves cutting action
lengthens tool life!

"LO-TORK" chip breaker drill

The tips on the two drills above show how "LO-TORK" Chip Breaker Drills work. A new convex shape has been engineered into the flutes. Chips meet this shoulder and are reduced instantly to manageable size without sacrificing any of the efficiency of the tool's point. At the same time the tool produces extra benefits as follows:

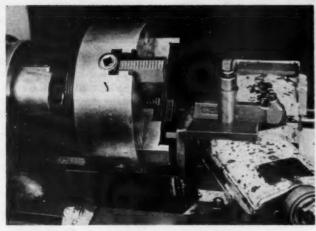
- 1. Improved lubrication at drill point.
- 2. Uninterrupted deep hole drilling.
- 3. Faster feeds. 4. Longer tool life.
- 5. New safety for operators.
- 6. Quick, easy regrinds.
- 7. Less power required.
- 8. Improved plant housekeeping.

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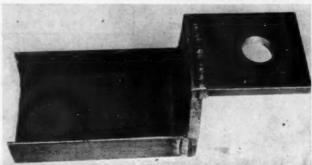
CHUCK INSTALLATION BRACKET

By H. J. Gerber

■ Installation of a heavy chuck on the spindle of a lathe is always a difficult job for one man to handle alone. It can be a hazardous operation also, both from the standpoint of back strain and from injury if the chuck is dropped. Also, many a lathe bed has been mutilated by chucks accidentally dropped on the ways.

The illustrated support bracket was designed and built in our shop to minimize the effort required to place and align these heavy chucks in position on the spindle nose. It will work equally well on all three types of lathe spindle noses in common use: threaded, cam lock, and standard external taper.

Welded "Z" shaped bracket facilitates positioning of chuck.



SHOP HINTS continued

The "Z" shaped bracket is made by welding a piece of structural channel to two pieces of flat steel plate. The top plate, which seats on the lathe compound, has been drilled to slip over the tool post. One of the lathe tool holders is then slipped in above it and the tool post screw tightened to hold the bracket in position. The chuck is now placed in the channel, the cross slide positioned to align the chuck back plate to the spindle, and the carriage is fed forward to seat the

chuck on the spindle nose. The operator can now use both hands to lock the chuck in place and does not have to worry about supporting its weight.

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Drill Jig for Mica

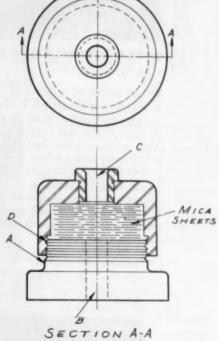
By Alex Arnott

• Mica is difficult to machine because it is fragile and likely to flake and split during the machining operations. In drilling the material we found it to distort and the drill would leave rough edges around the hole. Punching did not improve the condition. We obtained a smooth finish for this material with the use of the drill jig shown in the illustration.

By making a base (A) with a chip clearance hole (B) and the correct size drill bushing (C) on a cover with threads at (D) to suit the base we could pile a number of mica sheets to be drilled on the base and fasten the cover to it by screwing the base and cover in an assembly.

Compressed this way the drill made a clean cut of the material and we were able to do a number of pieces at one set up.

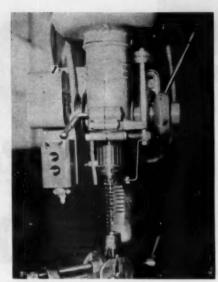
In operation we found it an advantage to knurl the cover for a hand grip during the drilling operation.

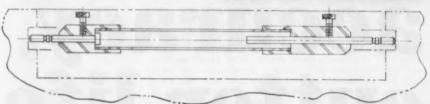


Drill jig compresses mica sheets for improved drilling.

Spring Protects Operator From Broken Drills

A simple but clever safety device on a drill press used at The Timken Roller Bearing Company's St. Thomas, Ontario. Canada plant protects the operator from broken drills or flying metal scraps. The drill bores holes in removable rock bits. As the chuck is lowered into the workpiece the spring closes together making a very effective close meshed shield and at the same time permitting the operator to observe his work. When the chuck is raised the spring expands but still covers the whirling drill. The device is simple, foolproof and requires no maintenance.





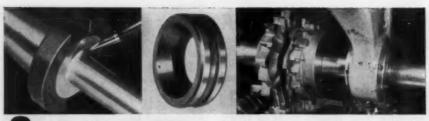
Telescoping Gage for Large Diameter Recesses

By F. Murray

• When the proper size micrometers are not available, large diameter recesses can be checked with a telescoping gage similar to the one illustrated. The two gaging pins are a slip fit in their sleeves. A piece of seamless tubing is used for spacing the sleeves and pins hold them in place. The grooves near the ends of the pins are for the purpose of providing a finger hold, if the pins should be oily.

When using the gage, the left hand gage pin is pulled out until its shoulder contacts the corresponding surface of the sleeve and then clamped by the brass thumb screw. The right hand gage is then brought in contact with the work and clamped in place. The left hand gage pin is now released by the thumb screw and the gage removed. The pin is now pulled outward until stopped by its shoulder and clamped in place. The measurement across both pins can be taken.

The extra length shown on the right hand pin is for the purpose of increasing the range of the gage.



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stress points, reduces possibility of breakage under heavy loads. S-J shell end mill arbors increase accuracy, too, because taper is held within .0002', with 10-20 microinch finish. Call your Scully-Jones representative or distributor for service on arbors, solid and adjustable spacing collars, shell end mill arbors, and precision sleeves. Look in the Yellow Pages, or phone us—BIshop 7-5900.

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SHULLING **ARBORS**

free literature





(See Number 1)



(See Number 2)



(See Number 3)

To receive copies of booklets described below, circle their identifying numbers on an Action Card, found opposite pages 80 and 272.

- 1. "The Spiral Point" suggests many areas in which to seek reductions in the cost of producing holes. Comparisons of chisel point and spiral point performance on identical operations are pictorially presented. Information is offered with respect to improvement in hole location, hole size, hole roundness and straightness; in drill life, in thrust requirements and in meeting the problems which are peculiar to sheet metal drilling. Cincinnati Lathe and Tool Co., Cincinnati, Ohio.
- 2. Recessing Tools Sketch Pad. A convenient guide for specifying recessing tools to help the tool engineer, shop foreman, production engineer or machine shop owner diagram and explain the machining operations which he wants done has been developed by Maxwell Industries, Inc., Ashtabula, Ohio, and is available free on request.
- 3. Educational Wall Chart that reproduces the threestory-high educational display, "The Dawn of This Age," in its new Hall of Progress has been issued by the DoAll Co., Des Plaines, Ill. The poster records the 157 major events that catapulted man from a life of drudgery, privation and insecurity to one of abundance, leisure and security in only 150 years—the Industrial Revolution.
- 4. O. K. Standard Way and Aluminum-Bronze Way crosssection sizes now available are contained in new catalog. One section is devoted to the newly developed center clad hardened and ground standard stock used in electronic and ultrasonic machines and machining techniques. Featured are laid steel flange slides and gibs—the company's newest products for use in the die industry. Ohio Knife Co., Cincinnati, Ohio.
- 5. Power Stepdown Package converts 220 or 440 volts to 110 for convenient, easily installed work lights at the machine. Bulletin 10-100A tells how the PSP unit prevents fires or explosions from short circuits, prevents employee hazards and possible damage to equipment and work in process. This conversion unit greatly simplifies electrical distribution system requirements. It bolts directly onto the machine which is wired for higher voltage and makes available 110 voltage for lighting or for small power hand tools. Mullenbach Div., Electric Machinery Mfg. Co., Vernon, Calif.

FREE LITERATURE continued

- 6. Dust er Mist Collectors. Brochure includes all basic information needed to select the most efficient dust or mist collector for the job: type and number of grinding, buffing, polishing or woodworking machines each model can service; detailed descriptions of frequently used accessory equipment and their applications. Aget Mfg. Co., Adrian, Mich.
- 7. Therme Electronic Indicators and indicating controllers are presented in Bulletin No. 65. These instruments indicate any process variable convertible to an electrical quantity (such as dc potential, current, or resistance) and may be connected to multi-point switches to check several hundred sensing elements. Thermo Electric Co., Inc., Saddle Brook, N.J.
- 8. Finishing Processes. New 30-page catalog on precision mechanical finishing and automatic finishing processes outlines in detail the various types of finishing and abrading processes such as grinding, deburring, descaling, and polishing. Roto-Finish Co., Kalamazoo, Mich.
- 9. The New Norton No. 2 straddle-bearing centerless grinder is presented in Catalog No. 1328. Straddle bearings on the grinding and regulating wheel spindles provide support on both sides of the wheel to

- prevent the deflection normally encountered when an extra wide wheel is mounted on the end of a spindle which is unsupported. Norton Co., Worcester, Mass.
- 10. Materials Handling Equipment, parts handling equipment, power rectification equipment, mechanical shaft seals, paper joggers and portable power tools are described in Condensed Catalog No. 596. Syntron Co., Homer City, Pa.
- 11. Adjustable Snap Torque Wrenches are illustrated and described in catalog sheet. Contains step-by-step picture story on how the wrenches may be adapted to various fastening jobs. Skidmore Engineering Co., Bedford Heights, Ohio.
- 12. Universal Bench Center M24 is built up of standardized measuring components. May be used for manufacturing, inspection, receiving, statistical control. Reduces design and manufacturing costs for control fixtures. Bench center is manufactured by Metron, Stockholm, Sweden. Literature from Skandia Tool Sales, Los Angeles.

As

CO

13. Adjustable Die Sections for the construction of dies to blank, form, trim, and flange are claimed to give more production, quicker setup, fast try-out. They are re-usable. Folder from A. R. Rivera and Sons Tool & Die Co., Detroit.



(See Number 6)



(See Number 7)



(See Number 8)

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An all new design, first to meet today's metal cutting needs. Embodies years of Kalamazoo experience and the best industrial design talent. Cuts 8" round, 16" flat, 8" pipe. Available with or without coolant equipment.



An automatic bar feed attachment for Models 8C, 816, 824 and 1220 Kalamazoo Metal Cutting Band Saws. A completely hydraulic self-contained unit which automatically feeds rounds, flats, square, hex, pipe, tubing, etc., any length from 1/8" to 30", or longer.



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Here's a low-cost saw that heating, plumbing and electrical contractors go for! Easy to move around in the shop or take along to the job. Cuts 6" round and 10" flat. Available with or without coolant equipment.

It will pay you to investigate KALAMAZOO. Ask your dealer for a demonstration or write for descriptive literature and name of your nearest dealer.

MACHINE TOOL DIV. Kalamazoo TANK and SILO CO.

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FREE LITERATURE continued

14. File-Size Kit of Barrel Finishing literature will be sent free of charge to anyone interested in new barrel finishing machines, methods and media developed by Almco-Queen Products Div., King-Seeley Corp., Albert Lea, Minn. Among the products described are spindle machines, portable rotary screen media classifiers, liquid CO² cooled tumblers, Vibrasheen Model VT-75.

15. Hydraulic Valves. Manual 230 illustrating the operation and application of pressure controlled hydraulic valves contains complete information on this increasingly important type of valve. Used for relief, sequence, reducing, unloading and counterbalance, the 3000 psi valve is recommended for any modern hydraulic circuit providing automation of machine operation. Rivett, Inc., Boston.

16. Radiation Pyrometry. Catalog No. 105 gives detailed information on the improved Pyro radiation pyrometer, and also features technical information on the principles of radiation pyrometry. Pyrometer Instrument Co., Inc., Bergenfield, N.J.

17. Contact Wheels and industrial rolls are presented in technical data book on the selection, application and operation

of Cosmo rubber contact back-up wheels for abrasive belt grinding and finishing. Chicago Rubber Co., Inc., Waukegan, Ill.

18. Balancer Catalog and Data Sheets describe and illustrate the new line of Bear Bekomatic production line balancers. Catalog points out the advantages of single lever control and shows how manufacturers are balancing up to 200 parts/hr with precision up to 0 millionths of an inch. Bear Mfg. Co., Rock Island, Ill.

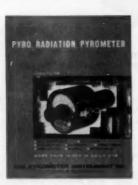
19. Turret Drilling Machines and work positioning tables are presented in Catalog No. 1T. The booklet explains the B&S turret drilling technique which utilizes a machine on which six spindles work on a single axis so that tools for drilling, tapping, boring or reaming can be indexed in any sequence and locked into alignment with the main drive spindle. Brown & Sharpe Mfg. Co., Providence 1, R.I.

20. Band Saw. Bulletin describes the recently introduced Delta 20-inch band saw, which features a variable-speed drive—50 to 4500 fpm—for cutting everything from stainless steel to aluminum, wood and plastics. Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.

21. Adjustable Center. Enco's new microset adjustable center is said to end all center alignment problems, affording precision center alignment in half the time.



(See Number 15)



(See Number 16)

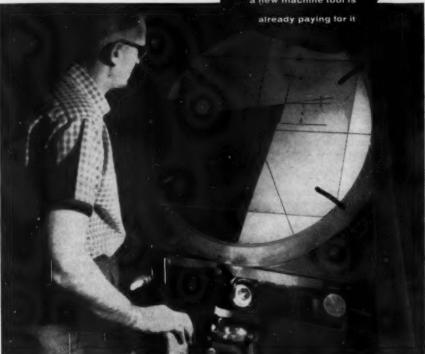


(See Number 17)

JONES & LAMSON OPTICAL COMPARATORS

the man who needs

a new machine tool is



Tool inspection is easy - same with "hot" stuff

Controlling dimensional limits of new and resharpened cutting tools is mandatory for every manufacturing plant. And it's so easy to do with a J & L Optical Comparator. In fact, the photo above tells the whole story. Just set up the tools and look at the precisely magnified image. Extreme accuracy, ease of operation and low maintenance are the keys to this operation. And they inevitably result in improved quality and lower costs.

In the atomic energy field, too, the same features make the unusual job simple. A customer says: "It is highly advantageous to have J&L comparators in a 'hot' lab — they can be moved from station to station without impairing accuracy, and are easily modified for remote operation."

Whatever your inspection problem, write Jones & Lamson Machine Company, \$20 Clinton Street, Springfield, Vermont.

Turvet Lation . Fay Automatic Lation . Precision Boring Machines . Throad & Form Grinders . Optical Comparators . Throad Tools

FREE LITERATURE continued

Bulletin AC-259 from Enco Manufacturing Co., Chicago.

- 22. Automatic Production Lathes. New 26-page booklet, Form 1213, covers the Gisholt Masterline No. 12, No. 12V, No. 24 lathes. Twenty-five actual job applications are shown and explained to demonstrate the versatility of these machines. Gisholt Machine Co., Madison, Wis.
- 23. Four-Way Air Valves. Bulletin 235 covers alternate bases and the integral speed control section for Hannifin Series CC 4-way air valves. Versatile piping is obtainable with the new universal and gasket mounted bases. Hannifin Co., Des Plaines, Ill.
- 24. Hopkins Process. Brochure describes the five melting techniques currently being used by Firth Sterling. Relative merits of material produced by the Hopkins Process are illustrated with photographs of macro-etch discs. Included are tables showing physical properties at room and elevated temperatures, illustrating the uniformity of Stercon HA-286, Discaloy, SAE 4340, and 16-25-6. Firth Sterling Inc., Pittsburgh.
- 25. Copy Shaper, Type URK, is an improved machine designed to offer the

following advantages: wide range of duplicate profiling to gage; no planing for marking; no hand controls required; no hand work in finishing; short production time; universality of application. Folder from Mercuria Co., Clarendon Hills, Ill.

- 26. Solid Carbide End Mills. Catalog covers Kennametal's new line of precision ground, fluted end mills in 15 different styles from solid bars of tungsten carbide. Also included is a table of suggested cutting speeds and feeds for 19 metals and non-metallic materials. Kennametal Inc., Latrobe, Pa.
- 27. Sine Dresser. Flyer tells of unit which dresses grinding wheels to gage-block accuracy—within .0003 inches. The Matco sine dresser diamond holder has 2" of travel. Ways and platen are hardened and ground. Gib is fully adjustable. Magna-Lock, Inc., Big Rapids, Mich.
- 28. Block-Type Tooling. Davis blocks and cutters described in Catalog No. D-510, together with block-type boring bars, form a complete and versatile tooling system to handle all boring and related operations within a ¾" through 17" diameter range. In any given series the six basic blocks are quickly interchangeable in the same bar without removing the bar from the machine. Giddings & Lewis Machine Tool Co., Davis Div., Fond du Lac, Wis.



(See Number 24)



(See Number 25)



(See Number 26)

NEW SMALL SIZE

FASTER ACCURATE ANGULAR SET-UP OF SMALL WORK



Magna-Sine (Model B-3-MS)
With 4" x 4" Working Area



Sine Plate (Model B-3-SP) With 4" x 4" Working Area

ROBBINS MAGNA-SINE

This new smaller Magna-Sine has all the time-saving, accurate angular set-up features found in larger Robbins Magna-Sines. Small to medium size work can now be set up in minutes instead of hours and with a lower investment in equipment. Magna-Sine table has a strong, fine pole, permanent magnet chuck that firmly holds small work without distortion.

ROBBINS SINE PLATE

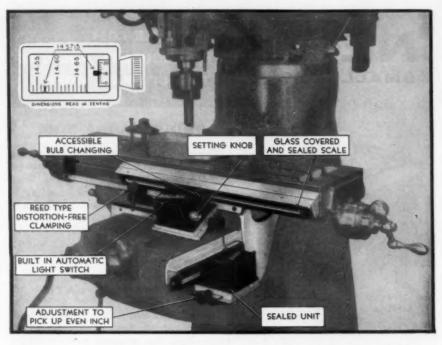
Robbins small Sine Plate is manufactured to the same high standards of accuracy as the Magna-Sine. This precision makes it ideally suited for angular inspection set-ups. The ground surface of the non-magnetic table has tapped holes for convenient clamping of any work. Also, sturdy construction makes this small Sine Plate extremely suitable for light machining operations.

Compound angles are quickly and easily set up with this Robbins equipment by combining either two Magna-Sines, a Magna-Sine with a Sine Plate, or two Sine Plates. Now, with lower initial investment, every shop can secure accurate angular set-ups for small work. With Robbins equipment, you do a better job, faster and at less cost.

OMER E.

Kobbins

COMPANY DETROIT 39, MICH.



Do you find this sort of Versatility in any other machine in your shop?

For example... consider the new BRIDGE-PORT Optical System. Here's what it accomplishes in terms of speed, accuracy and efficiency: ability to read a figure on the scale just as it appears on working drawing. No vernier estimations, no special operator skill; table can be quickly positioned in both planes.

Other attachments available for the BRIDGEPORT provide versatility in milling.

drilling, boring and shaping at any angle without change in set-up.

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The best evidence we can offer of versatility is this: practically every BRIDGE-PORT we've sold is the first of several installations in the same shop. Actual figures point to 20,000 customers who are using over 45,000 machines. We know of no other machine which gives this kind of acceptance through versatility, economy and quality. Do you?

Consult us or your nearest dealer for further details.

Bridgebort MACHINES, INC. Bridgeport, Connecticut Manufacturers of High Speed Milling Attachments and Turret Milling Machines

news of the industry





Flick-Reedy Builds Ultra Modern Plant

The new plant of the Flick-Reedy Corp., Bensenville, Ill., to be occupied by two manufacturing divisions of the company, Miller Fluid Power and Tru-Seal, incorporates many forward-looking ideas. On the one hand, operating economy is manifest in hundreds of details, nevertheless the over-all plant has an incredible human dimension. Advanced views of the obligations of the corporation to all its employees and to the community loom large in the entire plant and grounds plan.

Interiors are spacious and partition free. Rigid frame type of construction affords clear spans from one wall to another. The entire weight of the 220,000 sq ft building is carried on these frames rather than on load walls and partitions.

Flick-Reedy Corp.'s new plant will use a York Corp. heat

pump for winter heating and summer cooling. This unit is the largest of its type in the world and uses over 1,200 hp in electric motors to drive pumps, compressors and fans.

The plant features an indoor heated swimming pool for the use of employees. The fully tiled pool, shown at right, measures 50 x 60 ft and has a depth varying from 3 to 12 ft. Three diving boards (two low and one high) are located at the deep end of the pool.

Admittedly a luxury, the pool also has a great deal of practicality behind it. Besides being an integral part of the plant's fire prevention system, it has figured prominently in the water conservation program.





Ex-Cell-O Corp. 40 Years Old

A small group of Detroit toolmakers in 1919 formed a company to produce precision parts. That was the start of Ex-Cell-O Corp., which today has 29 plants throughout the United States, and in Canada, England, Germany and India. From an original floor area in 1919 of only 2,375 sq ft—the upper floor of the old building shown at left—the combined capacity today of all the company's plants totals over 2½ million sq ft. Entrance to Detroit Hamilton plant typifies Ex-Cell-O facilities today.

Experimental Production Begins on Inflatable Metal Tubing

Calumet & Hecla, Inc., Allen Park, Mich., will soon start experimental production of light-wall seamless metal tubing that can be shipped in ribbon form and inflated at the point of use.

The new material—to be known as "Strubing" (strip tubing)—holds promise of major innovations in diverse industries. Point-of-use inflatability makes it possible to ship thin-wall tubing economically—since only the tube "walls" are shipped and not the "hole." The process used in making Strubing, technically classified as cold rolling, provides an economical means of producing thin-wall tubing of materials and in thicknesses either unavailable today or available only at a prohibitive cost.

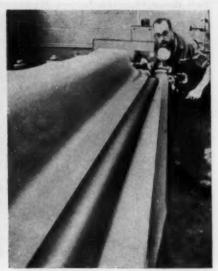
The method of manufacture is basically simple. The first step is to make a simple hollow shape by conventional techniques. It is then passed through a rolling mill where it is flattened into ribbon form. The rolling process is such that it elongates the original tube by making it thinner without changing the inside tube diameter. The more passes through the rolls, the thinner the Strubing.

It can be made in sizes ranging from smaller than the lead in a pencil to a pipe large enough for a man to walk through. It can be made as thin walled as household metal foil to as thick walled as conventional pipe. It will be possible to ship it in coil lengths of as much as 15,000 ft.

The methods and equipment to be used for inflating Strubing will probably vary with the application of the material and its dimensions. Engineers



have used hydraulic pressure, air pressure, and mechanical means to inflate



the tubing. In some sizes it can be inflated with tap water pressure.

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For Holes and Cores in One Operation

Bores a 6" hole in 3-1/4" machine steel in 6 minutes, a 5" hole in 1" boilerplate in 80 seconds!

- Rigid and Heavy-Duty
- · Saves Time
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- Excellent Chip Load Distribution
- · Easy Cutting
- 5 sizes for 1½" to 11¾" dia. work to 8" depth
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Ten Gear Manufacturers Honored

Ten plants in eight industries and nine cities in the United States have been awarded 1959 Honor Citations for "excellence in gear production and effective use of modern gear production equipment." The awards are sponsored by Michigan Tool Co., Detroit, producer of gear production equipment.

Gordon Swardenski, assistant plant manager for Caterpillar Tractor Co., Peoria, Ill., is shown here accepting award from Marvin Anderson

in behalf of W. L. Naumann, plant manager, who was away from the city at the time of the presentation. Caterpillar was chosen for excellence in



selection of tooling to reduce costs and increase quality in production of heavy duty gearing for road building and construction equipment.

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- Permits measurements in 2 dimensions plus checking of Radii, Concentric Circles, threads and angles.
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 6" x 6" and 8" x 40" capacity.

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With this Campbell Machine, you can -Cut 6-inch Diameter Hard Alloys in Less than 3 Minutes!

This Campbell wet abrasive cutting machine—the Model 406—will cut tubing, bar stock, angle iron, or any other shape up to 6" round or square—and it will cut practically any material, including the new super alloys and exotic metals.

High speed • 4 to 8 seconds per square inch is normal wet abrasive cutting speed. Cut 6" diameter hardened steel in less than 3 minutes. Accuracy • Model 406 will cut 3" diameter material to lengths within ± .010", 6" diameter within ± .030". Fine finish • No burn, minimum burr. Power oscillation • Cutting wheel moves back and forth across cut as wheel is fed downward. Result—greater cutting capacity, longer wheel life.

Proper coolant application • Large reservoir, 33 gallon/min. pump, give high coolant volume. Unique Campbell distributor applies coolant equally to both sides of wheel—a requirement for accurate cuts.

OTHER CAMPBELL MACHINES FOR ANY CUT-OFF NEED • Choose from four types of Campbell machines for wet or dry cutting—chop stroke, oscillating, horizontal or rotary—with capacities up to 14" rounds, 12" billets, plate up to 6" thick and 20 ft. long.

Write for Bulletin DH-260 for details on the Model 406, or describe your cut-off application and we'll send you information on the proper Campbell machine.

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Fastest Profile Milling and Duplicating

Save up to 50% and more machining time on contoured parts with both the R-200 and R-300 models. Single-lever control allows operators to duplicate complex parts in a fraction of the usual time.

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Capacity: 6" x 6" (7" x 6" Special)

1 to 1 ratio with master

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Other winning plants are: Chrysler Corp., Kokomo, Ind.; Dana Corp., Toledo, Ohio; Evinrude Motors Div., Milwaukee, Wis.; Ford Motor Co., Transmission Div., Livonia, Mich.; General Electric Co., River Works Plant, Lynn, Mass.; International Harvester Co., Farmall Works, Rock Island, Ill.; Miller Printing Machinery Co., Pittsburgh; Rockwell-Standard Corp., Newark, Ohio; Westinghouse Electric Corp., Nuttall Works, Pittsburgh.

Scully-Jones Forms Research, Development Corp.

Formation of the Scully-Anthony Corp., a research and development subsidiary of Scully-Jones and Co., Chicago, has been announced.

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The function of the new organization, with headquarters at 4707 Willow Springs Road, La Grange, Ill., will be to increase Scully-Jones' product and market versatility through development of new products in the electronic and electromechanical fields.

President of the new corporation is Myron Anthony, formerly director and now special staff member of the Electro-writer Division, Comptometer Corp. Other officers are: J. Dudley Lock-rem, vice president; Leonard H. Skoglund, Jr., treasurer; Joan Scully, secretary.

O. S. Walker Acquires Buck Mfg. Co.

The O. S. Walker Co., Worcester, Mass., has announced the acquisition of the principal assets and all patent rights of Buck Mfg. Co., San Jose, Calif. The O. S. Walker Co. is original designer and manufacturer of magnetic chucks. Buck Mfg. Co. manufactures BUX portable magnetic drill presses and related products.

Richard F. Carey, formerly sales manager for Buck, has been appointed general manager and secretary of the new corporation, which will operate under the same name and continue to do business from its present lo-

cation in San Jose.

M & M Buys Two Companies

The Motch & Merryweather Machinery Co., Cleveland, has purchased Modern Tool Corp. and Radial Cutter Mfg. Corp. of Elizabeth, N.J. Both companies are engaged in the manufacture and sale of carbide tipped circular saw blades.

Plant facilities will be moved to Cleveland and made a part of the company's cutting tool manufacturing division. Distribution will be handled through Motch & Merryweather's present organization.

Conant Broach Moves

Conant Broach Co. has moved to Blue Island, Ill., a suburb south of Chicago, increasing their manufacturing facilities by approximately 40%. The company has been in business for the past 20 years. Officers are E. D. Conant, president, E. B. Conant, vice president, and M. Berka, vice president in charge of engineering.

New Hermes Expands

New Hermes Engraving Machine Corp. and its subsidiary, Hermes Plastics Inc., have moved to a larger factory at 154 West 14th Street, New York 11. The new plant is equipped with the most modern equipment, is completely air-conditioned, and has been organized to streamline production and speed up service facilities in all phases of operation.

E. W. Bliss Co. to Sell Toledo Plants

A decision to sell the E. W. Bliss Company's inactive manufacturing facilities in Toledo has been announced. Formerly a metalworking press manufacturing plant, the facilities include a 165,000 sq ft Meehanite foundry capable of handling castings weighing up to 60 tons, and a 230,000 sq ft heavy machine shop. The plants have been inactive for over a year.



Appointments and Promotions

Personnel Changes . . . Executive and Production









S. H. Heller

N. D. Groves

N. J. Culp

George Beckwell

hilling hilling

S. Harry Heller has been appointed assistant to the president of S & S Machinery Co. of Brooklyn and Los Angeles. Heller will concentrate on the company's new equipment division, with special attention to dealer relations. . . . Walter Crafts, associate director, technology, Union Carbide Metals Co., Niagara Falls, N.Y., has been named new president of the American Society for Metals. Also picked by the Society's nominating committee were a new vice president, Wm. A. Pennington, professor of metallurgy, University of Maryland; a treasurer, Robert J. Raudebaugh, supervisor, iron-nickel alloys, International Nickel Co., New York City, and two trustees, Albert H. Fairchild, senior staff engineer, metallurgist, Western Electric Co., Winston-Salem, N.C., and C. H. Samans, associate director, engineering research, Standard Oil Co. (Indiana), Whiting, Ind. The new officers will be formally elected at the annual meeting of the Society in Chicago Nov. 4 during the 41st National Metal Exposition and Congress. Retirement of Ray T. "Doc" Bayless, ASM assistant secretary, has been announced. Bayless joined the staff in 1922 as the Society's first full-time male employee. . . . Dr. C. H. Toensing, for eight years research and development engineer with the lamp metals & components department of General Electric Co., has been appointed manager, powder metals research at Firth Sterling Inc., Pittsburgh. . . . The election of Russell A. Hastings to the

position of executive vice president of the K. H. Huppert Co., Chicago, was recently made known. . . . Two men in the metallurgical department at Carpenter Steel Co., Reading, Pa., have been promoted to assistant managers of research. Norman D. Groves has been placed in charge of chemistry and physics, and Neil J. Culp in charge of metallurgy. Philip Coddington, general manager of the alloy tube division. Union, N.J., has retired after 17 years of service with Carpenter. He has been retained as a part time consultant for the company. John S. Kline has been appointed general manager and chief executive of the division. . . . The appointment of George Beckwell as research and development engineer at Pines Engineering Co., Inc., Aurora, Ill., has been announced. . . . Dana H. Hayward has been elected assistant secretary of Pratt & Whitney Co., Inc., West Hartford, Conn. The appointment of Herbert A. France as manager of quality control was recently announced. . . With the intention of increasing the effectiveness of its public information program, the American Society of Tool Engineers, Detroit, has appointed three specialists to its headquarters staff. John W. Groomes will be administrative assistant to ASTE Executive Secy. Harry E. Conrad. E. Leo Koester will be public relations director and Don McAnally will assist him as communications manager.

Personnel Changes . . . Sales and Service



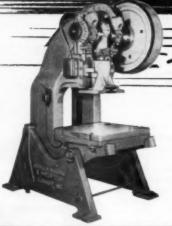
E. D. Hinkel, Jr.

Adamas Carbide Corp., Kenilworth, N.J., has announced the appointment of Lance J. Carrothers as sales engineer in the Dearborn, Mich. office. . . Edward D. Hinkel, Jr. has been appointed to the position of assistant sales metallurgist at the Carpenter Steel Co., Reading, Pa. He will be responsible for technical service to customers on engineering problems involving the selection of steels. The company has also promoted four members of its sales



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MODEL 27W (27 TON) MODEL 45W (45 TON) MODEL 60W (60 TON)

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D. I. Dumond



J. H. Conklin



G. H. Blank



L. A. McDonald

staff. Earl W. Dunkle has been made assistant manager, alloy steel sales; Robert E. Frederick is now assistant advertising manager; Luther T. Miller is manager of warehouse inventories, and Robert J. Buttery is appointed general traffic manager. . . . Clearing Division of U.S. Industries, Inc., Chicago, has made the following appointments: George E. Wind to service staff engineer; John A. Kopina to assistant service manager: Stephen Miller to sales manager, machine tool division; A. R. Burke, assistant sales manager, machine tool division; David L. Dumond, to chief engineer, machine tool division. J. Robert Flodine has been named advertising manager of Clearing. . . . The Galland-Henning Mfg. Co., Milwaukee, Wis., has announced the appointment of Eugene Wheeler as field sales manager of its Nopak Division. . . . Albert G. Galler has been appointed an abrasive engineer by Norton Company. He will call on accounts in northern New Jersey. . . . Assignment of Robert N. Boucher to new responsibilities as manager of distributor sales for the Philadelphia district has been announced by Parker-Hannifin Corp., Cleveland. . . . James H. W. Conklin has been named gen. sales manager of Pratt & Whitney Co., Inc., West Hartford, Conn. . . . The appointment of Richard B. Quinn to district manager of New England territory has been announced by Riverside-Alloy Metal Div., H. K. Porter Co., Inc., Riverside, N.J. . . . George H. Blank has been promoted to sales manager of Joseph T. Ryerson & Son, Inc., Buffalo. He succeeds Clive C. Earle, who assumed a similar post at the Ryerson plant in Philadelphia. . . Lawrence A. Mc-Donald, sales manager of Super Tool Co., division of Van Norman Industries, Detroit, has been elected vice president of sales. . . . Verson Allsteel Press Co., Chicago, has announced three new appointments in the organization. Walter C. Johnson has been named assistant vice pres., administration. He has been with the company since 1944 as draftsman, assistant sales manager, and for the past nine years as sales manager. C. J. Warmac has been appointed sales manager, hydraulic division. Paul C. Kjelstrom was made sales manager,



W. C. Johnson



C. J. Warmac



P. C. Kjelstrom

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R. L. Groves

mechanical press division. . . . Robert L. Groves has been assigned to the post of administrative assistant, sales department, for the Warner & Swasey Co., Cleveland.

BOOK REVIEWS

THE BOOK OF THE LATHE by C. T. Bower, Distributed by The Mac-Millan Company, 60 Fifth Avenue, New York 11, New York. \$3.50

The book first introduces the modern center-lathe, explaining in detail its many points of interest. It goes on to give much valuable advice on choosing a lathe, and then deals with the care, protection and adjustment of the machine. The remaining two-thirds of the book is devoted to the various turning processes and the author's methods, traditional or otherwise, for improving them. These chapters contain a mass of useful information on gadgets, special tools, labor-saving tricks and short-cuts that will prove of intense interest to every user.

MECHANICAL DESIGN AND ANALYSIS by R. R. Slaymaker, Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York. \$9.50

The unusual approach exhibited in this book was prompted by the author's ideas about the learning process, and about the engineer as a problem solver. He believes that a theory is more readily seen from the vantage point of a special case. However, since theories are developed to solve problems, Professor Slaymaker sees no reason to devise problems simply for purposes of illustration. Instead, he has looked to the actual business of designing for problems that needed to be solved.



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For heavy duty precision drilling on drill presses, jig borers, vertical mills, etc., Spiro chucks represent quality at its best.



PERFECTLY BALANCED . . . they are completely tested after assembly.

LONG LIFE—made of quality steel that is hardened and precision ground.

QUICK HAND TIGHTENING and RELEASE no key is required.

NON-SLIP GRIP — gripping power automatically tightens as load increases.

SAVES TIME — quick hand tightening and release greatly reduce down-time.

Available in five capacities from 5/32" to 5/8" — right hand drive only — for all standard taper shank arbors.

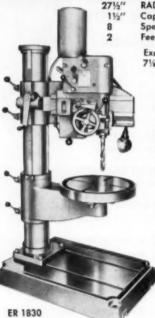


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New, Amazing LOW PRICE.

DIFFERENT

Different. Spindle rigidly held in two large "Zero Precision tapered roller bearings arranged in box-type design.

Different. Electrical switches and push-button stations fully enclosed in built-in well in head-

Different. Two independent clutches in apron for selecting power feeds.

Different. Cam-action tailstock clamp for rapid release and instant locking of tailstock.

Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

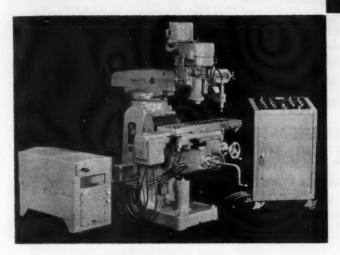
This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

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what's new in metalworking





Tracer-Controlled Milling Machines Combine Electronic Tracing with Hydraulic Power Feeds

Two new Gorton automatic milling machines-one, a threedimensional duplicator; the other, a production profiling machine, feature for the first time a combination of electronic tracing and hydraulic power feeds.

The Auto-Trace 180° duplicator, above, incorporates many novel features for milling convex and concave shapes at higher feed rates and to closer tolerances than was previously possible. This machine can also be operated as a conventional power or hand-feed milling machine.

The Auto-Trace 360° profiler may be used for production profiling inside or outside of simple or complex shapes, machining extruding dies, punch and die sets, cutting propeller and impeller blades, profiling multiple sections from a single section master. Tracing and cutting are completely automatic. The machine can be furnished with automatic vertical increment feed.

George Gorton Machine Co., Racine, Wis.





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stocked for immediate delivery

Now, Kennametal Inc. offers you a complete line of solid, precision-ground end mills of the same consistently high quality tungsten carbide used for years in other types of Kennametal cutting edges for the metalworking industry.

For every job requirement. Stocked in fifteen different styles, new Kennametal End Mills are available in diameters from $\frac{1}{16}$ " to $\frac{3}{4}$ " . . . a size and style to match your milling requirements.

For better finish. Kennametal has an extremely high YME...up to 94 million psi... three times that of hardest steel. High hardness, plus one-piece construction, provides maximum rigidity for smooth, even finish to meet high precision requirements.

For longer life. Kennametal End Mills are all-carbide . . . eliminate brazing failure, and provide maximum resistance to heat and abrasion.

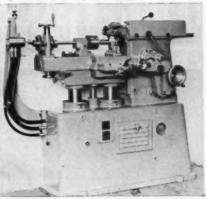
New 12-page Catalog now available. Ask your Kennametal Representative or write Kennametal Inc., Latrobe, Pa.

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Hydraulic Copy Shaper



Stylus device (in the front) can be adjusted vertically for cutting when the chamfering tool post, as illustrated, is being used, instead of the regular shaper tool post with the lead screw.

The Anderle copy shaper, Model URK, was designed to make punches, dies, electrodes (for spark erosion process), and form tools, from a template or any available master piece.

The shaper consists of a regular shaper ram and hydraulically controlled universal table. The table is equipped with an infinite variable power feed for cross and circular motion. Every vertical deviation of the template is transferred on to the table within .0005", the company states.

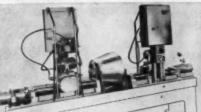
Profiled parts may be machined by automatic rotation (indexing) of the workpiece itself or by cross feed. For very difficult operations, the indexing and cross feed may be combined so the stylus device can follow the contour on the template. For normal machining of a workpiece without a template, the hydraulic system is used only for raising and lowering of the table.

Specifications include: stroke of ram, 12"; 180 SPM; cross feed of table, 10"; vertical travel of table, 5½"; table, 14" wide x 12" long.

Mercuria Co., Clarendon Hills, Ill.

MACHINE and TOOL BLUE BOOK

Drills Small Holes of 3/32"-5/8" Dia. to 24" Depth



Two 2400-A models mounted in opposite positions and operating simultaneously on one workpiece.

Model 2400-A deep hole drill unit drills small diameter blind or through holes 3/32" to 5/8" in dia., and 24" deep. Unit is reported to provide positive synchronization of spindle speeds with feeds at all times, accomplished by a gear and worm arrangement between spindle and feed. A 3600 rpm Dynabrake motor and timing belt drive power the spindle. Control panel controls all cycles and movements.

Modifications for special uses are offered, and special fixturing will be built if required.

20th Century Machine Co., Utica, Mich.

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Townsend's integration of FOUR major automatic machine manufacturers into ONE, has brought benefits to our customers virtually impossible heretofore without making a big capital investment. The Townsend Line of Qualimatic Machines performs a full range of machining operations which means greater productivity at reduced costs—specific savings in manpower—and greater accuracy... all at a minimum capital investment.

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COCHRANE-BLY: Metal Sawing Machines for CUTTING ferrous and non-ferrous materials in regular or irregular shapes up to 20° in diameter.



TAYLOR and FENN, Machine Division: Machines for MILLING a full variety of straight and spiral keyways.



THE CLEVELAND TAPPING MACHINE CO.: Standard and Special Machines for drilling and TAPPING . . incorporating rotary index tables.



THE TOWNSEND MFG. CO.: Hopper Fed Secondary Operation Machines for TURNING, drilling, pointing, grooving of headed blanks.

The H. P. TOWNSEND MANUFACTURING CO.



Brook St., West Hartford 10, Conn.



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James Smith & Son Makes and Sells Bullard Cutoff Machine



James Smith & Son, Inc., Worcester, Mass, have announced that they are manufacturing and marketing the Bullard cutoff machine. This machine was developed and formerly sold by the George H. Bullard Co., abrasive wheel manufacturers.

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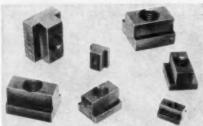
The wheel of this cutoff machine feeds vertically within the rugged frame construction, affording maximum protection to operator and others nearby. Wheel feeding and work clamping are semi-automatic, Hydraulic control is achieved by a single foot valve, thus leaving both hands free for handling stock.

Cutting is fast—up to two seconds per square inch, depending on material. Pieces are cut to length to usual fractional tolerances with minimum burr or burn. Carbide tips on the material V ways maintain squareness of cut and aid in longer wheel life. Excellent finish often eliminates further machining.

Use postpaid eard. Circle No. 84

T-Nuts End Table Damage

A new T-nut device that prevents studs from turning through to damage machine tables is a built-in safety stop formed through a special thread treatment that blocks the stud at maximum depth. Table-Saver T-nuts are made of specially rolled 4150 steel, heat treated for tensile strength of 170,000 psi (min.) and machined to fit any table slot.



Safety stop blocks stud at maximum depth.

Stock size ranges of threads run from $\frac{3}{6}$ "-16 to $\frac{7}{6}$ "-9; over-all height, $\frac{5}{6}$ " to $1\frac{1}{4}$ "; width, 1" to 2" and depth $\frac{7}{6}$ " to $1\frac{3}{4}$ ".

Jergens Tool Specialty Co., Cleveland,

Atomizing Coolant Prevents Air Pressure in Reservoir

Type J Trico-Mist, equipped with a 2 foot coolant line and mist generating nozzle, is designed for small precision drilling, tapping, milling, sawing, and grinding operations. Valves control air and flow of liquid coolant.



Because mist is atomized, there is no air pressure in plastic reservoir. Unit operates on 50 to 125 lb. air line pressure. It holds 8 oz. of coolant.

Trico Fuse Mfg. Co., Milwaukee, Wis.

Use postpaid eard, Circle No. 86

WHATEVER YOUR DRY MACHINING PROCESS-

Economical KETT "Mystic - Lube" Mist Coolant Generator



GIVES YOU ...

- Faster Operating Speeds
- Longer Tool Life
- Deeper Cuts
- · Better Finishes
- . Lower Costs
- Flexibility
- Portability
- Dependability
- Mist dissipates in the air—cools by refrigeration principle. No special coolants, no moving parts—operates off any air line. Compact, all-in-one unit, one and four gallon size, has features non-available in many higher priced

models. Quality designed for quick transfer, ease of maintenance.

WRITE FOR LITERATURE AND PRICE LIST
HE KETT TOOL COMPANY

5047 Madison Rd. Cincinnati 27, Ohio

Use postpoid cord. Circle No. 322

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Two Accessories for Air Cylinder Line



Accessory pin Model 80-AB

Allenair Corp. has introduced two new accessories for its line of air cylinders.

The first item is an accessory pin, No. 80-AB, which can be provided at either end of any cylinder and which has a throw of .062". The pin is actuated by a cam-boss on the piston rod as the rod reaches the end of its stroke. The motion of the accessory pin can be used to actuate an electric switch or a small

button valve to control another piece of equipment in synchronization with the air cylinder.

The second item is a bleeder valve, No. 70-VR, which can also be provided at either end of any cylinder and whose function is to bleed air from another

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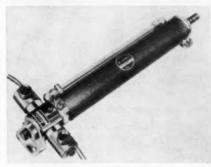
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Sept



Bleeder valve Model 70-VR

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE BUT TOPS AT ONLY \$149.50 (Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concover radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box.
Write for complete information.

Distributorship available in select territories.

ROTHEUSS TOOL

BOX 2694, ELMWOOD STATION

PROVIDENCE 7, R. I.

Use postpaid card. Circle No. 323

COMPANY

piece of equipment as the rod on the cylinder reaches the end of its stroke. The bleeder valve also features a camboss actuated pin.

Allenair Corp., Mineola, N.Y.
Use postpaid eard. Circle No. 87

Machinists' Tool Chests Come in Three Sizes

Machinists' tool chests, of wood or metal, are furnished with three different assortments of tools. The largest assortment contains 21 tools, the medium assortment 17 tools, and the smallest assortment 11 tools.

The chests have drawers of several depths and widths to accommodate the original assortment of tools, with ample room for additional tools which might be purchased later. When the cover is in its closed position, the entire chest can be locked.

Brown & Sharpe Mfg. Co., Providence, R.I.

Use postpaid eard. Circle No. 88



Wood or metal chest; 3 tool assortments



FLANGING MACHINES and CIRCLE SHEARS

No. 1 10 Ga. Circle Shear

No. 3 1/4" Cap. Flanger for

No. 4 %" Cap. Flanger for

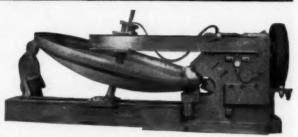
No. 5 1/2" Cap. Flanger for flat and dished heads.

No. 6 %" Cap. Flanger for flat and dished heads.

No. 56 Medel 3/16" Cap. Elliptical Head Shear and Flanger. Br Fr

No. 60 %" capacity circle shear with a 23"

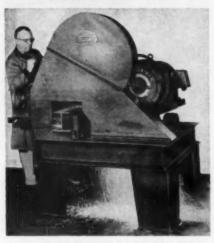
No. 40 %" capacity circle shear with a 151/2"



Above machine a No. 7, $\frac{7}{4}$ capacity. Shown with a $\frac{1}{4}$ x y' 6° dia. stainless steel head with a $6\frac{1}{2}$ knuckle radius. Can go up to as high as an 8" knuckled radius,

BLUE VALLEY MACHINE & MFG. CO.

30 HP Motor Featured In Chop-Type Metal Saw



Straight or oscillating feed.

All-purpose chop- or swing-type, high-speed metal saw has the advantage of powerful 30 hp friction or abrasive cutting and can be used with a grinding wheel. It cuts heavy structural members, bar stock, test sections, forging blanks, and many other materials.

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Featured are a powerful main motor of 30 hp, sealed-bearing spindle, timing belt drive, and a new dynamic suspension system which permits light fingertip feed without springs, counterweights, or adjustments.

The machine also provides straight or oscillating feed at option of the operator. Oscillating speed is variable. Shrouded blade-guard, containing sparks and chips, is a safety feature. Spindle and guard provide up to 30" blade capacity. Screw-operated double vise adjusts to handle up to 8"x8" sections or solids.

Ty-Sa-Man Machine Co., Knoxville, Use postpaid card. Circle No. 89

POWER when you need power! 11/2-75 TONS GREENERD, for 76 years, has manufactured Power-Performing ARBOR and HYDRAULIC PRESSES: maintenance-free; may be fur-

nished to J.I.C. Standards, and designed to handle the following variety of work:

- " ASSEMBLING
- " BENDING
- " BROACHING
- " BURNISHING
- " CRIMPING
- " EMBOSSING
- " FORMING
- MOLDING
- " RIVETING
- " SIZING
- " STAKING " STRAIGHTENING

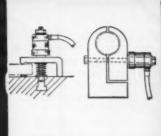
Write for Catalogue = 656

Unit Perforates 1/4" Mild Steel

Standard heavy duty line (Series HD) of unitized tooling perforates various materials up to 1/4" mild steel, or its equivalent, in tensile strength. Alloy steel holder provides crush-proof die seats. Built-in lubrication is provided. Bottoms guaranteed flat and square with centerline of punch, insure accurate location of perforation. Punch and die are easily removed during set-up. Tool Products Corp., N. Tonawanda, N.Y.



Built-in lubrication featured. Use postpaid card. Circle No. 90





HYDRAULIC FIXTURE LOCKING COMPONENTS **BOOST MACHINE OUTPUT!**

- · Compact—Builds into fixtures easily
- · Automate your fixtures for fraction of "do-it-yourself" cost
- · Ultimate speed in work loading
- · Greater locking force than any other method
- . A permanent investment-transfer from fixture to fixture
- · Single or multiple locking heads available with matching air-hydraulic booster systems.

ORDER NOW FROM YOUR STOCKING INDUSTRIAL DISTRIBUTOR

Write for free full scale templates and new literature! Attach this ad to your letterhead and mail



WILTON TOOL MFG. CO. INC.

SCHILLER PARK, ILLINOIS

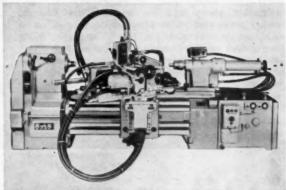
MTBB-99

Building Block Design From Basic Lathe

The D35 series of Bokoe spinning and flow forming lathes begins with a basic hand operated machine and culminates in the Hycoform heavy duty, hydraulic, semi-automatic copying machine which produces nose cones, cylindrical and tapered parts. It is achieved through a building block program by adding various accessories to the basic unit.

The operating spindle "Hycotom's speeds are 45-1200 rpm. Start, stop, and speed selection are remote controlled. Slideways and gib design are reported to provide positive guidance regardless of forming pressures.

The unit will flow form aluminum up



"Hycoform" hydraulic, semi-automatic copying machine.

to %" thickness, steel, up to ¼". Specifications include: maximum swing, 28"; longitudinal slide travel, 16"; cross slide travel, 6"; center distance, 42".

Cosa Corp., New York, N.Y.

Use postpaid card. Circle No. 91

ROOFE Live Centers, praised by users everywhere, are made of finest materials under rigid quality controls. ROOFE Standard Type Live Centers are popular.

ROOFE Standard Type Live Centers are popular because they offer maximum accuracy, lower costs, and increased production. Available in Morse Taper, Brown & Sharpe, Jamo. Straight and special shanks furnished to meet your "special" specifications. Write for our catalog.

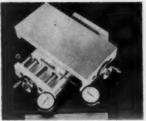


HOUSTON GRINDING & MFG. CO., Inc.

Two-Way Precision Compound

A two-way adjusting compound has been developed for precision holding and locating of work-pieces. Dial indicators and adjusting rods, mounted on the compound, compensate for backlash and allow adjustments to tolerances of .0001". Need for precision screws and nuts is eliminated. Slide can be adjusted to 4". One-way compound with 7" adjusting slide is also produced. Tracer Control Co., Hazel Park, Mich.

Use postpaid card. Circle No. 92



No need of precision screws or nuts.

STREAMLINE YOUR DRILL PRESS OPERATIONS WITH . . .



quadrill

(4 POSITION)

DRILL, REAM, COUNTERSINK, COUNTERBORE on the same drill press! No need to set up for each operation. A simple rotation of this turret head brings any of 4 drills or cutting tools into position. Speeds production—cuts cost!



quindrill / 5 POSITION \

TURRET HEAD

All the easy-operation features of the
Quadrill...plus an extra spindlel

FOR FAST, ACCURATE TAPPING— USE THE **QUARTET TAPPING—**

Fits any spindle on the Quadrill and Quindrill only.

CHICAGO QUADRILL

Company

1846 BUSSE HIGHWAY . DESPLAINES, ILL.

FOR COMPLETE INFORMATION

Use postpaid card. Circle No. 328

OK

TOOL MAKER'S

TOOL-EM %" DRILL PRESS



features

INSTANT SPEED CONTROL BUILT-IN

GEAR DRIVE

FOR EXTRA LOW SPEEDS

PRECISION SPINDLE

Designed and engineered for

FLOOR MODEL



tool room and precision use. Accurate mounting of head and column insures squareness of spindle to table. Heavy construction. Convenient direct reading variable spindle speed control.

Write for Literature and Prices.

BENCH MODEL

THE ELECTRO-MECHANO CO.
263 E. ERIE STREET MILWAUKEE 2, WIS.

Use postpaid card. Circle No. 329

High Production Honing For 1/4" to 1-1/2" Dia. Parts

A newly designed version of the Model 10 honing machine is being introduced for manual or automatic honing of bores from 1/4" to 11/2" in diameter. Improvements include raising of the control panel to a more readable position, front of cabinet fully enclosed, and new treatment of the head.

Rotation and reciprocation are powered by mechanical connections which



Tooling is designed to hone bearing rod ends and inner races with I.D. from .4995 to 1.005" and stock removal from .006 to .008. Production is 131 pieces per hour. Automatic sizing by the Plugmatic bore-to-bore sizing unit is reported to maintain size consistency within .0002" from bore to bore.

require a minimum of upkeep. Pneumatic controls are used for hone feed, including automatic expansion and collapse, and for automatic compensation for stone wear. Since no hydraulic circuitry is required, little floor space is needed.

The model is also available with an air-operated six station rotary indexing fixture, and it can be furnished with a variety of automatic equipment including magazine loading, automatic ejection, pre-gauging, post-gauging, etc.

The machine has a 0" to 2½" mechanically reciprocating stroke with

a 6" air-operated withdraw stroke, and maximum swing is 10".

Barnes Drill Co., Rockford, Ill.
Use postpaid eard. Circle No. 93

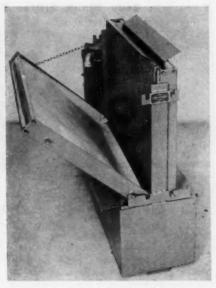
Unit Supplies Coolant Recovers Scrap

The Electroforce filtration and pump unit affords ample and properly filtered coolant supply as well as an efficient means of recovering chips or grindings of precious and semi-precious metals. It is equipped with disposable paper filters.

The liquid is not forced through the filter media. As a result, filtration efficiency is in the order of five microns.

Standard equipment includes centrifugal pump and filter unit having coolant flow capacity through filter of 10 gpm water or 5 gpm oil. The unit is also available with high-pressure pump for deep hole drilling. Tank capacity, 10 gallons.

Electroforce Inc., Fairfield, Conn. Use postpaid eard. Circle No. 94



Liquid is filtered without force.

make your mark

Whatever your need for product marking may be, Hoggson stamps can meet it. They are made of finest alloy steel, heat-treated to stand continuous impact without breaking face or mushrooming body. Ask about our inspectors' symbol marking hammers, type holders, hand stamps with locating or positioning attachments, marking dies for hand and machine





HOGGSON & PETTIS MFG. CO. 141H Brewery St., New Haven, Conn.

Use postpaid card. Circle No. 330

Squaring, Body Blank Slitter Processes 44" x 44" Sheets

A new duplex slitter. No. 5325, capable of processing 44" x 44" sheets, is available as either a squaring or body blank slitter, and can be used for either lithographed or plain sheets. Operating speed when used as a body blank slitter is 30-35 sheets a minute: higher speeds are obtainable when it is used as a squaring slitter.

The slitter consists of two units mounted on a

common base and driven in unison. The first table retracts, providing ample room to grind the cutters on the second slitter and for setup. Feed-out rolls are provided on both slitters. Moreover, back-up rolls for feed-out rolls on the first slitter prevent deflection.



Duplex slitter added to container making equipment line.

Rotating magnets working in conjunction with a hold-down mechanism provide positive separation and pick-up of strips by fingers on the feed chain.

E. W. Bliss Co., Container Machinery Div., Canton, Ohio.

Use postpaid card. Circle No. 95

DRILL HARDENED STEELS WITHOUT ANNEALING -

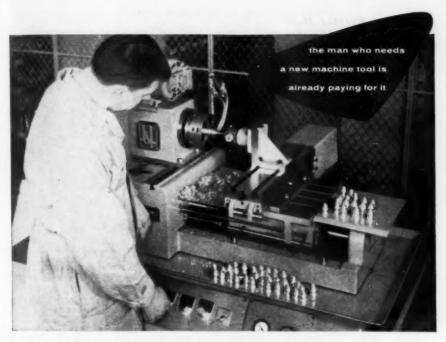


With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on workhardening steels and high carbon - high chrome steels of any degree of hardness. "HARDSTEEL" Drills fit standard drill presses. They save time and reduce

rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly. Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" Drills are cutting costs in thousands of plants.

> BLACK DRILL COMPANY, INC. 1374 East 222nd Street * Cleveland 17, Ohio

YOU HARDEN IT -WE'LL DRILL IT WITH - DSTEEL"



"Stingiest" Machine ever made

The J & L Precision Boring Machine is a mechanical tightwad: "Savings" for the owner are written all over it.

To begin with, its purchase price is far less than you would guess. Then, after it is set up, you find that just about anyone can handle its push button operation. Its simple design doesn't require expensive maintenance either.

This machine's "tightness" extends even to the spindle. It's not only extremely accurate, but also allows adaptation of various types of tooling. It has a threaded nose that will accept all standard air, or manually operated chucks and an inside taper to accommodate 5C collets.

Think that's economical? Well this penny pincher will turn, face and bore at high production rates, yet, because tooling combinations can be shifted quickly, it takes care of the short runs too.

One other thing about the J & L Precision Boring Machine . . . it has a tendency to push its owners into a higher income bracket. If this prospect leaves you undaunted, write for further information.



ONES & LAMSON Machine Company . Dept. 710, 528 Clinton St., Springfield, Vt.

Automatic Lathes . Tape Controlled Machines . Thread & Form Grinders . Optical Comparators . Thread Tools

Hydraulic Riveter Has Two Riveting Stands

Model HDR hydraulic dual RIVITOR is complete with all hydraulic and electrical equipment and controls.

Specifications include two riveting stands with 8" throat depth, adjustable to spacing from 1½" minimum to 18" maximum, center to center. The machine uses and sets two ¼" dia. solid steel rivets which are gravity fed from two 10" hoppers. A 420 psi oil pressure is used at each operating cycle

Most Drilling
Per Dollar!
Veet 3 foot
RADIAL

3370**
FOR DATES
OWICK BRIVERY

Features Found Only In Highest Priced Radials

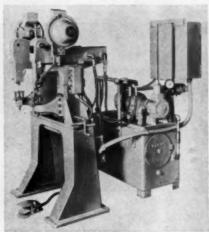
Finger-Tip Clutching Automatic Drill Ejector Push Button Elevation Centralized Controls Hardened Column & Way Inserts. Automatic Depth Control Timken Bearing Column & Spindle Head Glides on Ball Bearing Roller

Refer to Sweet's Machine Tool File or Hitchcock's Machine Tool Cyclopedia. 1959 editions, for our catalog.

Send for Brochure of Yeet's 16 Points of superiority and name of nearest dealer, who will arrange actual demansfration of the Yeet Radiol, in your plant, without abligation.

MEGD BY THE INDUSTRIES EAST DETROIT, MICH

Use postpoid card. Circle No. 333



Two 1/4" dia, rivets are fed from two 10" hoppers.

when setting two ¼" rivets. Maximum operating pressure is 1,000 psi.

Tomkins-Johnson, Jackson, Mich.

Use postpaid eard. Circle No. 96



WALTER

PRECISION DIVIDING ROTARY TABLES

With & Without Dividing Discs

- READABILITY: 6 SECONDS.
 CONSTRUCTED FOR LONG LIFE.
- . MAINTAIN PRECISION.
- AVAILABLE IN 10", 12½", 15¾", 19¾", 25", 31½".

Also many types of Universal Precision Dividing Heads and Attachments for most economical production.

Test reports furnished with literature.

Agents for U.S.A.

HODERNTOOLS

KARL A. NEISE 404 4th Ave., Dept. 99, New York 16, N.Y.

Use postpaid card. Circle No. 353

MACHINE and TOOL BLUE BOOK

Grinding Wheel Pellets Function as Cooling Agent

MM process abrasive and segmental wheels were developed to increase production on the grinding of carbides, cast iron, and hard-to-grind steels. The MM process involves the uniform, loose dispersion of fine abrasive pellets throughout the matrix of the wheel. The pellets function as a cooling element and release a flow of loose abrasive between wheel and work, increasing rate of stock removal. Macklin Co., Jackson, Mich.

Use postpaid eard. Circle No. 97



Faster grinding of carbides, cast iron, hard-to-grind steels.



Separate die sets with even upward pull. Die sets separate evenly and safely.

When you have die set pullers that remove the punch holder from the die shoe by a straight upward pull and the punch holder slides upward from the die shoe simultaneously and safely from both leader pins, you have Acro Die Set Pullers and you're saving time.

If you're not, this is how it's done with Acro Pullers: Indexed screw wrenches act as indicators, controlling the upward travel. This is an exclusive patented Acro feature and found only in ACRO DIE SET PULLERS. It may pay you to investigate. Write for further free information today.

OTHER ACRO TIME SAVERS FOR YOUR SHOP include Acroflex, drill rod racks, leader pin oilers and wing nuts. Write for complete descriptive folder. Ask for bulletin TP59.



Unit Converts Surface Grinder to O.D., I.D., Centerless Work

A portable grinder attachment, which converts any surface grinder into a precision O.D., I.D., and centerless grinder, is said to have an exclusive, balanced design which permits exceptional speeds and unconventional cuts.

For centerless grinding, the work rests on a motor-driven regulating roller, which is carried on extracapacity precision bearings. These bear-



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No chucking, no indicating required.

Mist Coolant Systems



"The Best in Mist"

Precise air and fluid controls, corrosion proof. Translucent containers let you see the liquid level. Write for new folder.

GRAYMILLS CORP 3721 N. Lincoln Ave. CHICAGO 13. ILLINOIS

Use postpaid card. Circle No. 335

ings absorb exceptionally heavy cuts.

For plunge grinding, a hold-down bracket is inserted into the unit in seconds. Neither chucking nor indicating is then required. Concentricity is reported as automatically assured with the diameter on which the part is held.

Cooling pump is furnished to provide clean parts and cool operation. Unison Corp., Royal Oak, Mich.

Use postpaid card. Circle No. 98



274-MA LAFAYETTE ST. ● NEW YORK 12, N.Y. L

HEADQUARTERS FOR PRECISION MEASURING INSTRUMENTS AND FINE TOOLS

Sep

Three Sizes of Power Slitting Shear

Power slitting shear features a deep throat and rugged and easily adjusted back gauge. Made in three sizes (cap.: 10, 14, and 20 gauge in mild steel), it has two reversible, interchangeable cutters which are driven through steel shafts by heavy duty gear set. Removable back gauge is clamped to both sides of machine frame for strong support. Cutting widths from 1½" to 30".

Beverly Shear Mfg. Co., Chicago, Ill.

Use postpaid card. Circle No. 99



Deep throat, rugged back gauge.

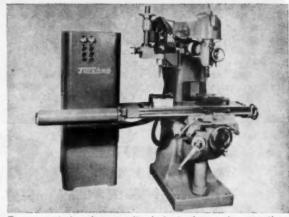


Use postpaid card. Circle No. 337

Fully Automatic Die-Sinker Converts to 360° Contouring Machine

As a fully automatic die sinker, the Recipro-Matic combines automatic feed rate control. automatic reciprocation, automatic depth control. and automatic indexing "pick-feed." This pick-feed feature is infinitely adjustable for rough, semi-finish, or fine finish operations. The tracing stylus will automatically follow the shape of the master. Adjustable stops, operable either from the motion of the table or the knee.

trip the table reversing valve at the end of each stroke, and simultaneously an index motor cross-feeds the work for a new cut.



Tracer control valve permits instant change in operations,

Turchan tracer control valve, used on the machine illustrated, permits instant changeover by the flip of a switch to a 360° contouring operation



CHAMBER GAS FURNACE

FOR HEAT TREATING

HIGH SPEED STEEL

Chambers 71/2" x 41/2" x 41/2" 2400° F. in 20 minutes

Consumption: Max. 100,000 BTU's per hour Maintenance 50,000 BTU's per hour

Furnace complete with motor and blower as illustrated. F.O.B. Factory \$380.00 Pyrometer and Thermocouple Extra if Required

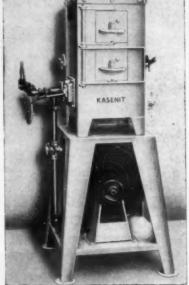
Write today for Free Descriptive Catalog.

KASENIT CO.

Estab. 1912

Dept. MT, King St.

Mahwah, N.J.



Use postpaid card, Circle No. 338

for complex shapes.

Turchan Follower Machine Co., Inkster. Mich.

Use postpaid eard. Circle No. 100

Strip Stock Feeders Handle Stock 1/2" to 61/2" Wide

A new series of automatic strip stock feeders, for the blanking of hot or cold phenolics, fibre, hard rubber, and compositions, are said to effect savings up to 80%. The machines attach to the bolster plate of any standard blanking press. Designated Series 65, the new models feature wider capacity than former models, handling strip stock from ½" to 6½" wide. Also featured is a longer, more efficient oven, with convenient hinged cover. An interchangeable roll feed is another improvement.

The feeders eliminate both the need for separate pre-heating ovens and delays and hazards of hand feeding.

Technical Design & Development Co., Inc., Devon, Conn.

Use postnaid card, Circle No. 101

EFFICIENT-LOW COST

Dust Collection

Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dust-kop FIRST among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.





37 STANDARD MODELS
TO CHOOSE FROM
• READY TO USE

Also a Complete Line of Mist Collectors

AGET

MANUFACTURING COMPANY

1402 E. CHURCH ST. . ADRIAN, MICHIGAN

Use postpaid card. Circle No. 339

Polyethylene Bags So Cheap! NOT A WHISPER—



NOT A WHISPER of bad packaging in NBC POLYCLEER BAGS.

They are the newest of everything great. Transparent, indestructible.

heat sealing, quick opening, protective, consumer reusable, AND economical.

The perfect self-selling impulse sales package for any product.

NORTHLAND manufactures NBC POLYCLEER BAGS by the millions.

All Sizes • Gauges • Styles • Shapes Plain and Printed 1-2-3-4 Colors Write! Wire! Phone!

NORTHLAND BAG CORP. 53-C School Street, Yonkers, N. Y. GReenleaf 6-1095

Use postpoid card. Circle No. 340



gear is custom-made

SPUR, SPIRAL, BEVEL, HELICAL,
INTERNAL, WORM, RACK, SPROCKET, ETC.
We deliver to your exact specifications

Abart carries no stocks . . . every gear is precision-cut to order. Any type of gear . . . from any material, in any quantity. 96 D. P. to 5/7 D. P. -1/4''

Send B/P and specs or sample for estimate

WRITE FOR ABART GEAR BULLETIN

P. D. to 18" P. D.

ABART GEAR and MACHINE CO.

4829 WEST 16th STREET . CHICAGO 50, ILLINOIS

Use postpaid card. Circle No. 341

Light Source Unit Is Safeguarded By Limit Switches

The Mercury Arc Lamp light source light unit, for use with all J&L 14" and 30" screen optical comparators, features high-intensity magnification



Shadow image of part is shown at 270 magnifications. Gear has 57 teeth; 1.1159" dia. base circle.

which is said to produce an exceptionally sharp shadow image even at highest levels of magnification, This results in improved optical inspection.

The packaged unit, with control element measuring 3'x2½'x1½', accommodates various standard makes of mercury arc lamps. It is safeguarded by interlocking limit switches, and is self-cooling.

Jones & Lamson Machine Co., Springfield, Vt.

Use postpaid card. Circle No. 102



Put Muscles In Your Lubricants

MOTOR MICA

ANTI-FRICTION COMPOUND

A clean white powder. Improves cutting cils. Dies last longer. Solves tough lubrication problems. Ask for free samples.

SCIENTIFIC LUBRICANTS CO. 3469 N. Clerk St. Chicago 13, III.

Use postpaid card. Circle No. 342

MACHINE and TOOL BLUE BOOK



and Ram Assembly with G. E. Mark II Numerical Control System.

GORTON NUMERICAL CONTROL

is field tested and proved in use

This is how Gorton Numerical Control saves you money on short runs;

- eliminates elaborate and costly tools, dies, jigs and fixtures
- —wastes no time because operator does not "pace" the work
- -makes no mistakes because operator skill not required
- extreme, repetitive accuracy is easy and automatic

easy and automatic typewriter operation

Punched tape . . . or magnetic tape control . . . is available to you on
SIX standard Gorton machines and also on Gorton custom-designed machines. You'll be agreeably surprised when you learn the low cost of
Gorton Numerical Control and how much more it gives you for your
money. For full information write

Saves You Money on —

- · face milling
- side milling
- · end milling
- straight line cavity milling
- · slotting
- · drilling
- · reaming and boring





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GEORGE GORTON MACHINE CO.

made quickly

1409 RACINE SINEE!

KACINE, WISCONSIN

Tracer-Controlled Pantographs, Duplicators—standard and special... Harizontal and 1893 Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Teels and Accessories.

-change overs in set-ups can be

-guides cutter in close quarters

-making punched tape is simple

without damage to work or cutter

-signals operator when tool

changes are needed

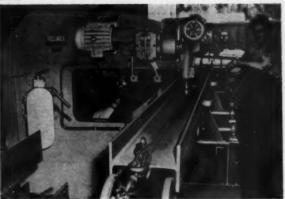
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I-Beam Splitting Machine

The Pullmax U-10 Ibeam splitting machine has a new automatic mechanism operated by pushbutton control for starting, penetrating and cutting of heavy metals.

In regular operation, the I-beam can be pulled through the machine at the rate of 10 to 20 feet per minute. The machine leaves a smooth, finished edge without distortion of the I-beam.

American Pullmax Co., Chicago.



p

Takes the manual labor out of a difficult operation.

Use postmaid card. Circle No. 103

New Line of Boring Bars carbide heads, permitting them to be Feature Solid Carbide Heads re-sharpened many times for maximum Carbide boring bars feature solid tool life. Constant clearance throughout

SPEED UP DRILLING & TAPPING JOBS!



JOHN'S DRILL JIG Self Centering

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/4" to 8"

0.D. Will cut tooling and production costs to minimum for 10 to 100,000 pieces. Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part 0.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2". 3\frac{1}{4}", 7\frac{1}{2}".

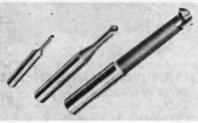
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HEUSER MANUFACTURING CO.

1644 N. Paulina St.

Chicago 22, III.

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Work harder steels, alloys, cast metals.



NEW! Self-Centering 5C Collet Stop

Quick friction adjustment Stays in fixed position. Will not distort collet. Will not move back. Also available for other collets and spindles. 30 Days Free Trial. Several Territories Openfor Distributors.

Write for Bulletin.

BYCO INDUSTRIES

2201 Snelling Ave. Minneopolis 4, Minn.

MACHINE and TOOL BLUE BOOK

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the life of the tool is assured since the tool is sharpened by grinding only the cutting face. The cutting head is double-brazed—both at the point of contact and at the center of the head—so it cannot come loose. Long tool life, comparable to external tool forms, is assured. Extra length allows great boring depth.

The boring bars are suited to working harder steels, alloys, and cast metals. Added life and extended accu-

racy more than justify their use in place of high speed steel tools, the company claims. The tools are available in sizes from $\frac{1}{6}$ "— $\frac{3}{4}$ ", in shank sizes of $\frac{3}{6}$ " or $\frac{1}{2}$ ", with tips ground for boring or facing.

Titan boring bars for jig borers are supplied in sets in handy wooden boxes.

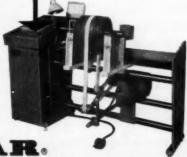
Titan Tool Supply Co., Inc., Buffalo, N.Y.

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Single Lever Control Does It!

A flick of the wrist shows both magnitude and location of unbalance. Unskilled workers can balance up to 200 parts an hour... sitting or standing. One large dial tells operator everything he has to know to do perfect balancing.



Write for FREE DATA BUL-LETINS giving full information on both BeKomatic and Bear Balancers.

BEAR.

the most complete line for both PRODUCTION and MAINTENANCE BALANCING
BEAR MFG. CO., Dept. M-3B Rock Island, III.

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GRIND AND LAP at the same time. Get lapping accuracy at grinding prices. Obtain finishes of 1 RMS; flatness and parallelism to 2 millionths of an inch... with metals, plastics and ceramics.

SPEEDLAP is a "lap-grinding" unit which uses a non-chargeable lap plate, also higher lapping pressures, to give greater and faster penetration.

Ask for cost and production estimates based on samples of your work. Job lapping services also available.

ABRADING SYSTEMS COMPANY

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Novel Abrasive Wheels

Wheels and rolls of non-woven nylon fiber with abrasive grain dispersed



38" wide wheel polishing copper sheet. (Hinged guard is out of way.)

throughout offer help in finishing and polishing for the metal, plastics, rubber, and woodworking industries. Wheels have performed well on polishing stainless steel sheet, cleaning aluminum panels before anodizing, and producing satin finishes on flat sheets of ferrous and non-ferrous metals. The wheels are not designed for stock removal or even for normal grinding or deburring, although their action may be varied by changing type and size of grit, among other changes.

The wheels are made in all normal diameters, face widths up to 60", and in a grit range from 100 to 600. Various abrasives have been used, but most testing has been done with silicon carbide. Wheels should be run at low speeds—approximately 2600 sfpm.

Behr-Manning Co., Troy, N.Y.

JIG BORING

and
Large Precision Machining
Done to your specifications
WE HAVE 22 JIG BORERS

KIDDE PRECISION TOOL CORP.
25 LOCUST AVE. ROSELAND, NJ.

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MACHINE and TOOL BLUE BOOK

CARBIDE "THINSAWS"

FOR FAST, PRECISION SAWING, SLOTTING or SLITTING and LONGER SAW LIFE

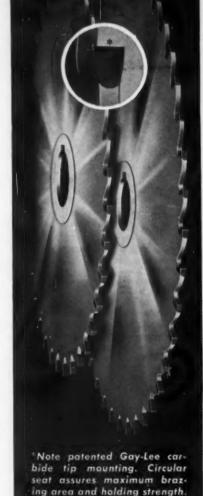
Gay-Lee Carbide "Thinsaws" maintain positive alignment for full-depth cutting without run-out. "Thinsaw" thickness as low as .030" with tolerance held to .0001". Sizes from 11/4" to 10" O.D.

Patented carbide tip design and circular seat mounting assure maximum brazing area, positive seating and greater holding strength - tips will not break loose.

For fast, precision sawing, slitting or slotting of cast-iron, non-ferrous, plastics, wood, etc., use Gay-Lee Carbide "Thinsaws". Any tooth form available. For application recommendations, send details of your problem.

Patented-Manufactured under license.





Machine Automatically Bores 260 Parts/Hr.

Ex-Cell-O style 112-D precision boring machine handles over 260 automobile transmission parts every hour. The automatic cycle includes assembly, loading, precision boring and unloading.

An assembly unit mounted at the front of the machine presses a bronze bushing approximately 21/4" dia. into the cast-iron body of the component. The bushings are gravity fed from a hopper, while the castiron bodies as received from a conveyor are rolled into the assembly

station, again by gravity. The bushings are pressed hydraulically into the bodies and two body-and-bushing assemblies



Automatic cycle: assembly, loading, boring, unloading.

are completed at each cycle of the machine.

An automatic loading mechanism transfers assemblies to the machine chucks. Here a finish precision boring operation is performed on the bushings, before the parts are automatically unloaded and passed to a gaging station at the rear of the machine.

Ex-Cell-O Corp., Detroit. Use postpaid eard. Circle No. 106

Coolant Stops Rust, Rancidity

Cold Stream water-soluble metalworking coolant stops rusting, resists rancidity and reduces the threat of dermatitis. It does not hold dirt in suspen-

Allman Universal Hand Tapper 5 TIMES FASTER

A great time, labor and material saver. Fixture taps five holes to every one using the free hand method. Eliminate coeffy tap breekage.

CHECK THESE FEATURES:

. Articulate arm swings clear of large table for placement of work.

. Limitless number of sizes of tapped holes without moving work piece.

. Vise holds work as small as 36"

. Floating tap lecates itself in hole.

· Individual spindle holds taps, thus change requires only seconds,



Information

No. 25th Ave. . Melrose Park

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SPECIAL RECESS AND STANDARD SNAP GAGES "made to AGD" STANDARDS





Sketch shows! GS-5 Recessed Snap Gage to Check Dimensions in undercut on Shafting

Se

H. v. H TOOL & Instrument Co. 204 Lafayette St. N. Y. 13, N. Y.

Use postpaid card, Circle No. 388

MACHINE and TOOL BLUE BOOK

sion, so stays clean for weeks, even when used on cast iron.

The coolant is said to provide superior finishes and extend tool life. Surfaceactive agents are used in the formula to reduce surface tension and bring the solution in close contact with metal surfaces, enabling the product to cool even more effectively than water. This permits increases in speeds and feeds.

Cold Stream has a combination of

anodic and passivating rust inhibitors to guard against both electrolytic corrosion and atmospheric moisture. It does not contain a bactericide. The product is neither a sodium nitrite nor a soluble oil, but is formulated to provide the best cooling and lubricating features of chemical and oil types of coolants, the manufacturer claims.

Johnson's Wax, Racine, Wis.

Even without pilots or finger stops . . .

"RFC" Automatic ROLL FEEDS*

control feeding to utmost accuracy

REVERSES INSTANTLY

Shift Feed Finger spring from one lug hook to opposite side

CAN'T SLIP

Each wedge has 4 points of contact

NO RATCHETS OR PAWLS . . .

to wear down

PATENTED CLUTCH MECHANISM..

with fewer working parts for less maintenance

PATENTED

Write for new brochure containing 39 standard feeds which are applicable to all METALS, FELT, CARDBOARD, PLASTICS, PAPER, WIRE, RUBBER in ALL WIDTHS, LENGTHS and THICKNESSES.

IMPORTANT: Please state make, type and tonnage of press when inquiring.



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AIR OPERATED HIDRTH PRODUCTION MARKING MACHINE

MARKS ANYTHING

- · Round or flat . . . tubular or taper
- · Air equipped production model only \$375

Write for illustrated Bulletin

HJORTH LATHE & TOOL CO.

8-12 Beacon St.



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VERNIER DEPTH GAGE, No. 601, has a long vernier plate, 1.255", with readings in .001". Vernier graduations are flush with the blade graduations—eliminating parallax. Spring pressure clamp holds blade firmly in place. Available with 6", 12", and both 6" and 12" blades, with readings over full range of 6" and 12". With or without case. Brown & Sharpe Mfg. Co., Providence, R.I.





COMBINING THE ECONOMY OF CARBIDE THROW-AWAY INSERTS with the added savings of universal positioning, the Throwaway tool holder eliminates the need for having several fixed-angle holders in different sizes. Instead of removing holder from machine, cap and locking insert are loosened, carbide indexed, and cap and locking insert retightened. Maxwell Industries, Inc., Ashtabula, Ohio.





COLLET ADAPTER, the Rapid-Lok, is designed to speed up tool and cutter changing on horizontal and vertical mills, jig borers, etc., without using adapters, draw bars or wrenches. By means of mechanical leverage produced by internal balls and tapers plus lugs of the locking lever, tools are rigidly held. Good concentricity with minimum run-out is provided. Six styles offered.

Tree Tool and Die Works, Racine, Wis.
Use postpaid card. Circle No. 110



Multiform BENDER CUTTER

CUTS, BENDS, PUNCHES

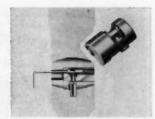
Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend, and cut round or flat brass, bronze aluminum, steel, etc., up to ½" x 1½" as illustrated, other models up to ½" x 8"

J. A. RICHARDS CO. KALAMAZOO, MICH.

Insertable Cam-Lock Cartridge

A Cam-Lock cartridge, for use in Clark floating finishing bars and other tools, permits location of one or more cutters along the bar without need for gun drilling a long hole through the bar length to contain locking pin. Cartridge contains both cam and locking pin. Cutter can be rigidly locked or allowed to float. Unit eliminates frozen locking pins, Robert H. Clark Co., Beverly Hills, Calif.

Use postpaid card, Circle No. 111



Cutter can be rigidly locked.

One of these Wilson "Rockwell" instruments will do your

hardness testing job

No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

"Rockwell" Hardness Tester-for most hardness testing functions.

"Rockwell" Superficial Tester-for extremely shallow indentations.

TwinTester-Combines functions of "Rockwell" and "Rockwell" Superficial testers.

Semi and Fully Automatic-for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

Special Machines—for testing large objects, internal readings, and other unusual applications.

Diamond "Brale" Penetrators—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.



Write for **Bulletin RT-58**

ILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division American Chain & Cable Company, Inc.

230-T Park Avenue, New York 17, New York Use postpaid card. Circle No. 356



Safe for operator—sheeve acts as guard—unprotected, unsupported blades become a hazard to face and body of operator when cutting pressure is applied.

> NEW BAJ ONE-PASS KEYWAY BROACHES AVAILABLE

The Baj Tool Company

(Manufacturers of Baj and Glenny Broaches)

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GEO. T. SCHMIDT, INC.

1802 W. BELLE PLAINE AVE.

CHICAGO - 13 - ILLINOIS

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Rotary Table/Index Fixture

Model 710-V index is designed to provide a power rotary table for surface grinder as well as an index table, hand operated, to give a combination index 2, 3, 4, 6, 8, 12, and 24 for jig grinder holes, drilling, or grinding equally spaced holes. It can be used in inspection as well as production. Parts can



Index on 10" circle, 24 sections, held to .0003.

be quickly drilled without fixturing or drill jigs. Index on ten inch circle is held to .0003 on 24 sections.

Table is powered by electric motor with variable speed control. Forward-reverse switch clutch is provided for hand operation and indexing. To operate just plug in any 110-v outlet.

M & M Tool and Mfg. Co., Dayton, Ohio.

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Barrel Finishing Compound

Esbec 680, dual purpose abrasive compound, combines fast cutting action with fine surface refinement and cleanliness of surface on most metals, including steel, stainless steel, copper, brass, aluminum. During the first two to five hours, depending upon such elements as mass height, speed, the abrasive compound cuts extremely fast and thereby greatly shortens cutting cycles. At the end of this cutting action, the abrasives break down and become polishing agents which produce an extremely smooth surface finish.

When completely broken down, the

compound is in such a finely pulverized state that it can be rinsed easily from the load. As it contains no aluminum oxide, it will not "charge" the work, nor will it leave any objectionable gray film.

It is said to increase the cutting action of any media-natural or manufactured -and helps to maintain the natural color of the metal, thus improving subsequent burnishing results. In refining flat surfaces. Esbec 680 with any media will speed up the operation and produce finer finishes.

Esbec Barrel Finishing Corp., Stamford, Conn.

Use postpaid card. Circle No. 113

Instrument Measures and Records Roughness Profile

The Microcorder extends the Micrometrical line of surface finish measuring instruments to include the measuring and recording of the roughness



Measures pitted, porous, flawed surfaces.

profile of a surface. It can be moved from place to place within the production department or laboratory and set up in any convenient location near the parts which are to be measured.

The instrument is particularly useful for studying surfaces which are pitted, porous, have flaws, scratches or other irregularities.

Micrometrical Mfg. Co., Ann Arbor,

Use postpaid card. Circle No. 114



Use postpaid card, Circle No. 359

HIGH SPEED motor driven WIRE STRIPPER

Exclusive "Triple-Disc" Cutting Mechanism centers cable for accuracy, gives more and better cutting edge. Only \$159.50° F.O.B.



Completely removes any type of insulation (including plastic) cleanly, without damage to solid stranded or multi-color cable to 1/2" diameter. Strips to 11/2" length. Works instantly, simple to adjust. 1/4 H.P., 110 volt single phase AC motor. Immediate delivery. Write or wire today.



"Subject to Change without notice,

HIGH SPEED HAMMER CO., INC.

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Automatic Rivet Setters Rivet Fragile Materials

Fragile materials such as ceramics, plastics are said to be successfully riveted with a minimum of breakage with Chicago Rivet pneumatic rivet setters.

The line includes single and multiple setters as well as machines for integration into automated operations. Air line pressure requirements are 50 to 60 lb. Cushioned operation not only reduces breakage but also makes the machines suitable for fastening assemblies of uneven material thicknesses.

Chicago Rivet & Machine Co., Bellwood, Ill.

Model 180 double rivet setter has a throat depth of 6" and will set two .098" steel tubular or two ½" brass tubular or split rivets at the same time. Maximum rivet length that can be set is 7/16". Quick-change hoppers with integral raceways permit setting other rivets of smaller body diameter and within maximum length.

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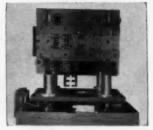
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200

Tungsten Carbide Parts for Dies

The Banko method of constructing segmented dies provides for interlocking tungsten carbide parts to be bolted to a softer metal base. This method is reported to prevent tilting or sideways movement of segments. Manufacturers are now able to use tungsten carbide without paying high cost of solid tungsten carbide dies, says the inventor, George Banko, president of Cleveland Tool & Die Co., Cleveland, Ohio.

Use postpaid card. Circle No. 116



Double E transformer die.

HOW TO GET A

"thread-start"

The diagonal knurled head on Blue Devil Socket Cap Screws gives you a "nonslip" grip. It's typical of the advanced design found in all

Blue Devil

SOCKET SCREW PRODUCTS



SOLD ONLY THROUGH AUTHORIZED INDUSTRIAL DISTRIBUTORS

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New Design

Greater Precision

Greater Rigidity -

Model R-3

6 Sizes . 8 Models

Guaranteed 60 seconds or less total accumulative angular error. (60 seconds equals .00087" at 6" diameter.)

Write for FREE Catalog Number 23.



TROYKE MFG. CO.

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Spin Your Rivets Faster

on the

NOISELESS

LINLEY RIVETER



Send Today For Bulletin R
LINLEY BROTHERS CO.

Also Builders of Jig Borers 673 State St. Ext., Bridgeport 1, Conn.

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New Model Wet Blaster

The Liqui-Breez Model LB-1002, is mounted high to minimize splashing with slurry, and is installed so as to permit easy removal for cleaning. There is a squirrel cage type fan with



Operator clearly views work at all times.

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ample capacity to remove fog and permit clear vision at all times. A pencil-type gun is attached to adjustable mounting rod so operator's hands are free for the work.

Size of model is 67" high; cabinet, 24" diameter; working area inside cabinet is 380 sq.in.

Tobin-Arp Mfg. Co., Minneapolis, Minn.

Use postpaid card. Circle No. 117

JIG GRINDING and JIG BORING

to your specification

At your disposal: Our sub-contract its boring department, one of the best equipped in the East.

A. K. TOOL CO., INC.

ROUTE 22, MOUNTAINSIDE, N.J. Telephone: ADams 2-7300

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MACHINE and TOOL BLUE BOOK

Deep Throat Press

The Minster Series 20 deep throat type punch press, capacities of 15, 25, and 35 tons for light and medium punching, cutting and flanging on large pieces, features a "C" type frame which

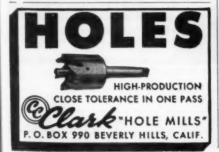


Capacities of 15, 25, and 35 tons.

forms a deep throat that allows punching to the center of a 60" circle. Two extra long, removable gibs guide the slide.

Single gearing is available to provide slower operating speeds. Cast iron main gears with H section spokes and steel pinions are standard. The press can be equipped with an adjustable bed when varying die space is needed.

Minster Machine Co., Minster, Ohio.
Use postpaid card. Circle No. 118



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CARBIDE TIPPED SAWS & FINISHING TOOLS

The right tool for the right wood, metal or plastic. Smoother cutting line, no ripping, no chipping. Makes big cuts in replacement and maintenance costs. Write for free catalog today.



P.O. BOX 291-C, JASPER, INDIANA Use postpaid card. Circle No. 373



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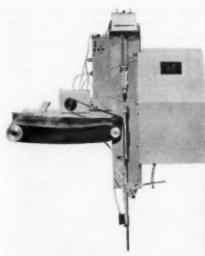
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Automatic Marking Machines Use Electrolytic Method

Automatic, high-speed machines that employ the electrolytic marking process suit the part to be marked and its production requirements. Three marking methods are available: plating, etching, and "a-c" or oxide mark. Any type of lettering or line drawing can be permanently marked on any conductive material.

The machine shown marks carbide tool bits at a rate of 3180 pcs/hr. It is magazine fed and entirely automatic. Carbide workpieces are fed upward by an air-operated device. When the part is in marking position, the electrode head snaps down, marks, and retracts. The marked piece is pushed onto the rubber conveyor belt and a new part is indexed into position. The machine stops automatically when magazine is empty.

Electromark Corp., Cleveland.



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Marks 3180 carbide tool bits per hour.

Use postpaid eard. Circle No. 119



Sept

Rifflers Added to Swiss File Line

An addition of four Riffle shapes has recently been made to the Engis line of Swiss pattern Steel files. The single-end Rifflers have ½" shank and are available in flat, round, crossing and square shapes—cuts No. 00 and No. 1. Used with the Di-Profiler hand machine with its variable speed of up to 100 strokes per second, these steel Rifflers assure savings in filing time, yet retain the feel of hand operation on intricate or hard-to-get-at work, the manufacturer claims.

Engis Equipment Co., Chicago.



Flat, round, crossing and square shapes.

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Dull chrome plated, will not chip or peel.

Exceptionally easy to read. Clear, wide Vernier slide.

Hardened Stainless Steel. Read inside, outside and depth measurements from the same scale. English or English and Metric combination in handsome contour case.



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ALINA CORPORATION

122 East Second Street, Mineola, L. I., N. Y.

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OK





Larger Area Knuckle-Head

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The Model 1100 Knuckle-Head universal ball joint adjustable spindle drilling and tapping head can be operated with from two to eleven spindles, converts any single spindle drill press into a high-production multi-hole operation. It is said to be more flexible and offers



Model 1100 can be used for drilling or tapping with from two to eleven spindles.

a larger work area than previously possible.

The new model will either drill or tap by utilizing easily interchangeable Ettco face plates. It has a capacity up to 5/16''in steel and can be set to any hole pattern within a working area of $6'' \times 12''$.

Ettco Tool & Machine Co., Inc., Brooklyn, N. Y.

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CAM MILLING

Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

Your Inquiries Answered Promptly

HIMOFF MACHINE CO., INC. 13-22 46th Bood Long Island City 1, N. Y.

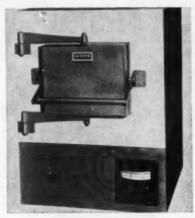
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MACHINE and TOOL BLUE BOOK

High Temperature Furnace

The Lucifer 6055E box-type furnace has elements with heat ranges to 3190° F. Resistance of the elements does not change with use.

The 6055 Series includes seven models in box or tube design. All furnaces are complete units and include an automatic controller, platinum-rhodium



Elements heat to 3190° F.

thermocouple, magnetic contractor, high temperature elements, terminals, aluminum strips for terminal connections, selector switch, and an element transformer.

Lucifer Furnaces, Neshaminy, Pa.
Use postpaid card. Circle No. 122



At new lew price \$124,50

New 1959 Model "88" RADIUS DRESSER Outperforms them all

Cut production time without sacrificing aseuracyl Easy to seccuracyl Easy to sec, easy to see, eliminates necessity of guard remoral. Somerset Badius Dresser turns "tricky" jobs into routine operations. Write for free illustrated folder.

SOMERSET TOOL CO. Hillside, N. J.

Use postpaid card. Circle No. 380

September, 1959

PRICE + SERVICE = COST

As with any item, both factors must be considered in purchasing

Punches & Dies

SO the LEWTHWAITE CATALOG SHEETS list our large, planned stocks of interchangeable and exceptionally long wearing punches and dies—with prices—

AND include charts and instructions for figuring correct clearance allowances for both type and thickness of metal being punched—so that the best tools are used under the best conditions—

THEN leave it up to you to buy—try—and decide.

WHEN you do, we think you will join the ever-growing list of T. H. LEWTHWAITE customers.

Send for catalog sheets on our complete line today.

T. H. LEWTHWAITE MACHINE CO.

312 East 47th St.

New York 17, N.Y.

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JEMCO ELECTRIC HAND SHEARS and NIBBLERS

In use by major industries for over 25 years 10% Greater Efficiency—10% Lower Cost



Nibblers supplied with either standard or with right angle heads to cut corrugated metal.

Nibbler capacities-

18 gauge; 14 gauge and 11 gauge Shear capacities—

7 gauge; 12 gauge; 14 gauge and 16 gauge

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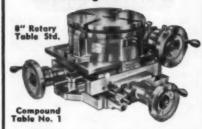
JEMCO TOOL CORPORATION
22-24 State St. Seneca Falls, N.Y.

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207

The STEVENS Line

Introducing NEW Series



ROTARY TABLES, 5-8-12-15-18-24" sizes both standard & dial indexing types. ADJUSTABLE TILTING TABLES, COMPOUND TABLES, \$1 - 2 ROTARY-COMPOUND TABLES \$1-11/2-2

INDEX CENTERS - multiple spindle See your dealer or write for bulletins

The JOHN B. STEVENS Company SOMERSVILLE, CONN.

"se postpaid card. Circle No. 383

DORMAN **Automatic Reverse**

TAPPERS Automatic Torque Control, One

Minute to Adjust, Prevents Tap Breakage, Operator Need Not Be Skilled. • WIDE RANGE TAP CAPACITY.

No. 1A FRICTION DRIVE TAPPER—Ca-pacity No. 2-56 to %" in Steel—1/2" in Aluminum.

No. 2B POSITIVE TAPPER — capacity 3/4" to 1/4" in Steel.
No. 3A POSITIVE TAPPER—capacity 1/2" to 1/4" in Steel—1/2" to 3/4" Pipe Taps.
No. 4A TAPPER—capacity 3/4"
\$62.00 to 2" in Steel including Pipe

Write for Bulletin Taps. . PRODUCTION THREADERS

with Round Split . . . Button Acorn Dies. IMMEDIATE DELIVERY

THRIFTMASTER PRODUCTS CORPORATION

UM STREET, LANCASTER, PA

Use postapid card, Circle No. 384

Hollow Spindle Unit Cold Point **Drills Super Hard Material**

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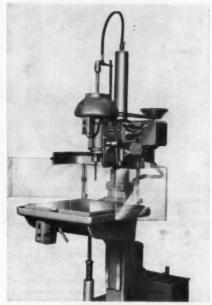
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This Buffalo hollow spindle drilling machine is designed for use with Mossberg "Cold Point" drills and Hoffman "Diamond Impregnated Bits" at production speeds up to 10,000 rpm. It features accurately balanced hollow spindle, coolant system having a pump with a capacity to 100 psi, special splash guards, and a rubber-flex collet chuck.

High pump pressure is not necessary when drilling glass or ceramics. City water piped to spindle is sufficient,



Speeds to 10,000 RPM in hard material.

The machine can also be used for regular production drilling.

Buffalo Forge Co., Buffalo, N.Y. Use postpaid eard. Circle No. 123

Angle Iron & Magnetic Chuck Are Combined in One Unit

Magnetic angle iron, Model No. 9195, combines the advantages of a universal right angle iron with a magnetic chuck to speed set-ups and work clamping

MACHINE and TOOL BLUE BOOK

Septe

for inspection. Featured is a magnetic face plate which can be quickly energized by a 90° turn of a recessed control bar, one located on each end face. Workpiece can be easily adjusted by hand at 25°.

Over-all dimensions are: 4¾" long, 4¼" wide, 6½" high; approximate

weight, 18 lb.

Taft-Peirce Manufacturing Co., Woonsocket, R.I.

Use postpaid eard. Circle No. 124



Precision ordnance gage is being inspected for parallelism and squareness.



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SURFACE TYPE for Continuous Duty. Work by Simple contact. Operate on any A. C. voltage. A size for every purpose. Demognetizing is essential to tool room and assembly work. A size and style for every application; guaranteed to do the job.

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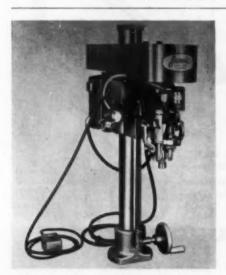
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LOOP THROUGH TYPE for continuous or intermittent duty.

Use postpaid card. Circle No. 386



Speeds of 575, 958, 1437 and 2415 rpm.

Adjustable Pitch Lead Screw Tappers

Automatic, adjustable pitch lead screw tapper is adaptable to any drill press table. The unit is furnished in five standard models and has four speed pulleys, giving speeds of 575, 958, 1437 and 2415 rpm.

Tapping cycle is completely automatic—through air and electrical controls—and can be interconnected with the controls of an indexing table, if desired. Tap depth is electrically controlled and can be set to any depth within the stroke of the lead screw unit, which features rapid conversion from one pitch to another. The tapper can be equipped with standard hand-operated lead screw units where complete automation is not desired.

Jarvis Corp., Middletown, Conn.
Use postpaid eard. Circle No. 200

Band Machines Provide Extended-Travel Tables

To facilitate large, awkward band machining operations, the extended-travel work table machines are now available in the following DoAll lines: M-series, low priced machines; No. 2-series, standard machines; No. 3-series, heavy duty machines, and the Zephyr series of high-speed machines. They are designed by the suffix HB.

The tables of the HB machines have a working stroke of 41". They will move a one-ton workpiece at any feed rate from 1.5" to 96" per minute. This permits every cut to be made at the best feed rate for the material and the capacity of the machine.

All of the HB model machines feature changing of the saw band without disturbing the setup. The control console is on a separate pedestal that can

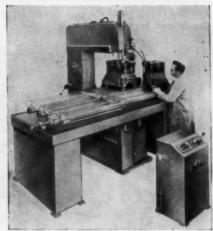


Table has working stroke of 41".

be moved where most convenient.

The DoAll Co., Des Plaines, Ill.

Use pestpaid card. Circle No. 125



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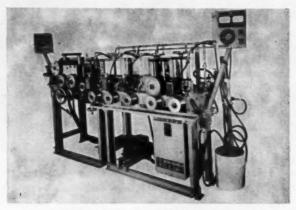
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Bar and Tube Marker Conditions Surface



Meets need of clean surfaces for printing on moving stock.

This combination surface-conditioner bar and tube marker prepares tubing bearing residual drawing compound and greasy surface materials for acceptance of offset printed marking and indented marking. As the material to be marked enters the power driven guide rolls, a series of solvent bearing spray nozzles and adjustable squeeges remove any compound from the tube surface which would affect the quality of the subsequent marking.

Opposite the offset printed mark, the inciser portion of the unit provides

the means for producing indented marking, eliminating the need for separate marking stations.

The unit is adjustable for bar and tube sizes from ¼" to 6" and is adjustable for marking speeds from 125 to 1000 ft per minute. It may be supplied in any combination of these stations: printing only; printing and incising; printing and conditioning; printing, incising, and conditioning.

Jas. H. Matthews & Co. Pittsburgh.
Use postpaid eard. Circle No. 178

Heat Treatment Toughens C-Clamps

Added to the Wilton Perma-pad lossproof swivel, deeper throat design, and a modified Acme screw, the new heat treatment feature is said to make Wilton clamps virtually maintenance-free. These design changes were necessary because of the growing importance of C-Clamps in aircraft, missile, automotive, and general manufacturing operations.

To meet these needs, Wilton uses clamp bodies that are closed die forgings, of I-beam design, for a maximum strength-weight ratio, providing a tenRang

Septe

INDEXING MACHINERY - CAMS - GENEVA GEARS - TURNTABLES

EISLER MAKES OVER 300 DIFFERENT TYPES OF INDEXING TURNTABLES. SPECIAL MADE TO YOUR SPECS. WRITE FOR CATALOG.





Dr. Charles Eisler Me. Founder

Charles Eisler, Jr. Pres. EISLER ENGINEERING CO., INC.

762 SOUTH 13th STREET

NEWARK 3, NEW JERSEY

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PNEU-MATIC TAPPER 0.0 High Production. Air Operated Range: 0-80 to 34 "-16





Type and Size for Every Job!

STANDARD

Pressure Sensitive Drive Range: 0-80 to 10-24

Commander Tappers are made in 10 models - each designed to handle tapping jobs over a wide range. From the Commander Tapper line, you can select the right unit to give you the exact performance your job requires. Whichever Commander Tapper you select, you will get unequalled performance and tapping economy. Sold

and serviced by drilling and tapping specialists. Write for the Commander Production Tool Catalog and name of nearest Distributor.



MFG. CO. 4227 W. KINZIE STREET MFG. CO. CHICAGO 24, ILLINOIS



sile strength of 100 to 120 psi, after heat treating.

Wilton Tool Manufacturing Co. Inc., Schiller Park, Illinois.

Use postpaid eard. Circle No. 177

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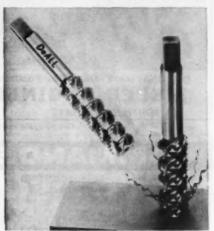
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Tap Features a 52º Spiral

Extended life, greater accuracy and accelerated chip removal is said to be achieved using the Hy-Spiral tap, featuring a 52° spiral. This provides high shear at the cutting point and uninterrupted chip ejection, and coupled with the 10°-12° face hook and 2 to 2½ thread chamfer, produces smooth,



Tap offers longer life, greater accuracy.

accurate threads in even the most difficult to machine materials.

The free cutting action and positive control of chip flow makes these taps especially suited to both aluminum and zinc die castings, which are traditionally difficult to tap blind in the vertical position.

The Hy-Spiral line includes both NC and NF pitches in machine screw sizes from 3 through 13, and fractional sizes from 1/4" through 1/2" in 1/16" increments.

The DoAll Co., Des Plaines, Ill.
Use postpaid card. Circle No. 126

Sept

Forge Die Sinking Cutters

A new line of Edco Metal cutting tools is being made expressly for the forge die sinking trade, of a new type steel with special heat treat to give maximum performance in today's harder, tougher forge die blocks. The cutters have a special Rockwell hardness of C-66-67. Standard tools include angle cutters, ball cutters, roughing cutters, end mills, tool bits, rectangles, and complete styles and sizes of carbide burrs.

Edco Tool Co., Wyandotte, Mich.



New type steel gives maximum performance in today's harder, tougher forge die blocks.

Use postpaid eard, Circle No. 127





Codol's balanced lubricating and cleaning action provides a high surface finish without use of extremely fine grit wheels. Fine oil particle size results in a neartransparent solution. No machine maintenance or cleaning problems.

D. A. STUART OIL CO., LIMITED 2727 South Troy Street, Chicago 23, Illinois Canadian D. A. Stuart Oil Co., Limited, P. O. Box 430, 43 Upten Read, Scarborough, Ontarie, Canada

Water Mix Cutting Fluids: Codol . Hi-D . Solvol . Dasco Super Soluble

Use postpaid card. Circle No. 392

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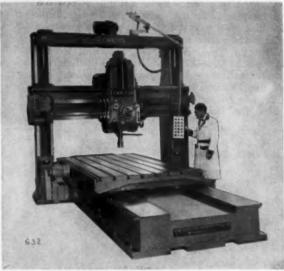
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Planer Type Drilling Machine Provides Large 72"x126" Table

A new model planer type drilling machine is said to offer the largest automatic positioning table for a machine of this type, measuring 72" wide and 126" long. Workpieces can be accurately located for drilling, reaming, boring, tapping, and milling by any one of three methods: pin bar spacing, vernier and rules, and numerical control, by tape or manually. The machine can be used on short production runs of on single pieces.

Numerical control permits positioning the



Pin bar spacing, vernier, or numerical control locates work.

Tosco Way Curtains



Protects ways and screws on boring mills, Kollers, grinders, etc. Keeps chips and abrasive dirt out of ways, and moving parts—Prolengs life of machine, saves costly repairs and overhaul time.

hall time. Roller constructed of seamless steel tube with special long life springs. Curtain is of seeprene fiberglass material impervious to oil and cutting compounds.

3 standard sizes Special sizes to order

TOOL SUPPLY CO.

Use postpaid card. Circle No. 393

table with accuracy reported as ±0.0002". When the tape control is furnished, positioning is through precision racks and pinions with read-out unit for locking the spindle (separate from the driving units for table and head).

The pin bar unit features pin override control, allowing the operator to override the pins without having to remove them from the bar.

The drill head is mounted to a spe-

ENTE

PILOT BUSHINGS

Frictionless
-Rotary

For core drilling, T.
C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch.
Write for details.

GATCO ROTARY BUSHING CO. 42330 Ann Arbor Road, Plymouth, Mich.

Use postpaid card. Circle No. 394

MACHINE and TOOL BLUE BOOK

cially designed rail which affords maximum rigidity under all work loads within the machine's capacity, 36 spindle speeds and 18 feeds are offered.

Precision milled slots in the table enable the operator to locate workpieces quickly and accurately. The table operates on non-metallic ways which provide for increased loads and reduced friction, it is reported. An automatic lubrication system provides for the table and other areas needing lubrication.

Movement of the table is 120". Traverse is at the rate of 140" per minute, with head traversing at the rate of 100" per minute. A pendant type pushbutton station for controls enables the operator to work from either side of table.

The Carlton Machine Tool Co., Cincinnati, Ohio.

Use postpaid eard. Circle No. 128



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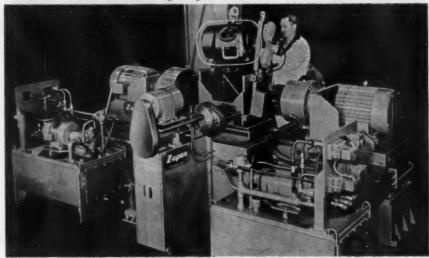
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Varied Hole Patterns Drilled By Single Heads



Three drill patterns are drilled by each of four drill heads.

In this installation are introduced new heavy duty, 20 hp feed units. Three drill patterns are reported drilled by each of four drill heads. The changeable pat-

Speed production . . . cut costs with

INSTANT CHANGE



AUTOMATIC KEYLESS CHUCK

Lets you change tools in seconds without stopping the spindle. One chuck does the work of several spindles, won't chew up tool shanks. The greater the torque, the tighter the grip,

DRILL PRESS VISE

Floats and locks instantly, positively, in any position on table. Holds work safely for accurate drilling and tapping. Two models: 9" and 12" capacities.

Write for illustrated folder and name of nearest distributor to AMF Tool Division, American Machine & Foundry Company, 224 Glenwood Ave., Bloomfield, N. J.



AUTOMATIC CHUCKS

/AHLSTROM®/FLOAT-LOCK® SAFETY VISES

terns are made by removal of the nonoperating drills when casting and fixture are changed from one job to another.

Accommodating more than one pattern of drilling and tapping is allowed when designing the machinery in development stage. The drill heads are located in the form of a cross, the casting being drilled from four sides simultaneously. A total of 108 holes is drilled.

Zagar, Inc., Cleveland, Ohio.
Use postpaid card. Circle No. 129

Deburring, Finishing Barrel

Model DBM-10 Super Mite portable deburring and finishing barrel, for processing small lots of parts, operates at a fraction of the time and cost involved in hand operations. Its ability to handle close tolerance radii and low microinch surface finishing is claimed to make it



Auxiliary unit for special parts.

equal in performance to larger, more elaborate equipment. It is particularly suitable as an auxiliary unit for processing special parts.

The 12" dia x 8" wide barrel has a ½ cu ft capacity and is equipped with a cam type door.

Almco, Queen Products Div., King-Seeley Corp., Albert Lea, Minn. Use postpaid card. Circle No. 130



Precision Boring, Turning, Facing . . . on Automatic Cycle

The Boreking twin-spindle, automatic cycling, precision boring, turning and facing machine performs a complete finishing operation on a blank in one cycle. While the front of the piece is being finished on one spindle, the reverse side may be done on the other. With proper tooling, it is possible to perform multiple operations. The cycle



While front of piece is being finished on one spindle, reverse side may be done on the other.

New Discovery

CERAMIC-BRASS-CARBIDE-PLASTIC-STEEL

Lasts for years

Never Loads - Self Cleaning - Indestructible

Money Back Guarantee

1/3 Price of Diamond

GRITS: 180-220-360-500 \$8.75 Newtools Inc. Amityville, New York

Use postpaid card. Circle No. 398

Cut any Shape... straight or irregular

Make any cut — curved, straight or irregular, faster, casier and better with less material waste on a Beverly Threatless Shear. You can turn work to any position make a

and make a dean cut as you go. H and I e sheavy gauges with ease—lighter metals without distorties. 4 models — capacties. 18 gauge to 3/16" mild. All shears equipped with H.C. H. C. Blades for cut-ting Stainless.

INSIDE SLOTTER

8" Reach — 16 ga. cap. Makes inside slotting cutting

makes inside slotting cutting faster, easier, cleaner. Punch and die arrangement of 5 blades assures accuracy, clean cutting action. Cuts 2½5°×,2° slot at one stroke. Threat design permits piveting work at any point in stroke for special inside cuts, Note sample cuts.

See your Beverly Dealer or write for illustrated catalog.



BEVERLY SHEAR MFG. CO., 3005 W. 111th St., Chicago 43, Ill.
Use postpoid cord. Circle No. 399

8-3 with Ball Boaring Hold Down can be set for any combination of feeds, with fast approaches and returns where

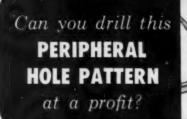
applicable.

The main table slides on two round ways protected by accordian pleated boots. The head and bed are scraped and fitted to a granite base lapped to flatness of .00005", resting on a rubber cushion. The machine is capable of repeating to a tolerance of less than .0002" on a face cut and .00005" on a bore.

The two air motor units allow for independent adjustments of the main table and cross slide feed. Spindle speeds are infinitely variable between 400 and 4000 rpm and can be set independently for each spindle. The drive is from a single ¾ hp motor with a variable speed drive.

Russell, Holbrook & Henderson, Inc., New York, sales agents for the U.S.A.

Use postpaid card. Circle No. 131





U.S. Drill Head engineers can show you the cost-reducing way to do these tough jobs—just as they did for a missile manufacturer, producers of automotive parts, diesel engines, and in many other industries.

New products of the space age continually



bring new manufacturing problems. Take advantage of U.S. Drill Head Co.'s leadership in applying multiple drilling and tapping heads to your drilling operations.

U.S. Fan-Shaped Heads for peripheral drilling—full ball bearing shaft mounting,

shaved gears, super-finish spindles, full torque, maintained precision.



Adjustable and Fixed Center Multiple Drilling Heads Individual Lead Screw Multiple Tapping Heads

UNITED STATES DRILL HEAD CO

BURNS STREET . CINCINNATI 4. ONIO

Combination Name, Numbering, Lettering Head for Hot Stamping

Acromark hot stamping head No. 441 is a 25 to 35 wheel numbering head that also does trade-mark and name stamping in any desired combination. More or fewer wheels are provided by substituting engraved wheels for blanks and vice versa.

The unit is provided with thermostatic heat control and a thermometer to provide proper stamping temperatures. The cartridge type heating element is mounted in the center shaft or axle, which is oversize to provide stamping strength under heat stress.

The Acrofilm permanent lubricant treatment for high temperature operation is claimed to insure that wheels will operate perfectly at all temperatures. A visible index and pointer indicates the exact setting of wheels.

An adjustable tape-feed guide provides for the use of roll leaf foil in any hot stamping press having automatic



No. 441 is a 25 to 35 wheel numbering head.

roll leaf feed. Where automatic foil feeds are not available they may be provided with the head.

Acromark Co., Elizabeth, N.J.

Hand Feed Grinder Now Comes in Hydraulic Model

Model 17H is the new 10" x 16" hydraulic feed surface grinder previously

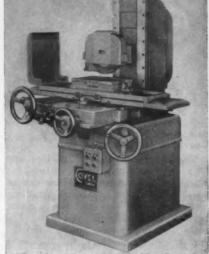


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UNION MANUFACTURING COMPANY
290 CHURCH STREET, NEW BRITAIN, CONN
Builders of Union Chucks and Jato Airborne Fixture Tables.

available only as a hand feed model (Model 17).

Incorporated in the design of the new model are the following features: 14" capacity under full 12" diameter grinding wheel; infinitely variable table speeds up to 70 fpm; infinitely variable cross feed from .005" to .250" with rapid



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Massive vertical column supports grinding head for heavy cuts and fine finish.

traverse for dressing the wheel from the chuck or quick positioning the work; 2 hp 1750 rpm motor drive spindle, precision ball bearings, greaselubricated and sealed for their life.

Covel Mfg. Co., Benton Harbor, Mich.



Use postpaid card. Circle No. 402

September, 1959



Use postpoid card. Circle No. 403



TAPER PINS

DIAS. 9/0 to #4

As specialists in stainless-steel, instrumenttype pins, we offer quantity runs of standard size Taper Pins. Tolerances are held to .001 on dia. Sizes run from #4 down to 9/0. Send your blueprints for prompt quotation.

THE PEASLEE METAL PRODUCTS INC.

470 Tolland St. • East Hartford 8, Conn.
Use postpoid cord. Circle No. 404

Improved Drill Sharpener Handles Drills 1/4" to 11/4"

An improved model of the Lisle drill sharpener, Model DG-3, features a patented feed system which is said to assure correct heel clearance, chisel or web angle, and cutting lip angle. It will handle all types of drills in sizes from \(\frac{1}{6} \)" to 1\(\frac{1}{4} \)".

The complete unit, which requires no extra accessories, lists at \$175.00.

Lisle Corp., Clarinda, Ia.

Production CHUCK

Will pay for itself in 60 to 90 days

On turrets, engine lathes, cuttingoff machines, drill presses or any type of chucking machine, the Barker Two-Jaw or Three-Jaw hand operated chuck will increase production up to one third and actually pay for itself while doing it in from 60 to 90 days.

Hand lever eliminates pneumatic and hydraulic systems, yet closes and locks jaws with lathe running or stopped. Over 30 years of labor saving, production boosting operation.



mand lever close and lecks while



Jaws locked

Write for bulletin 201 today.

THOMAS HOIST CO.

Use postpaid card. Circle No. 405



No extra accessories needed,

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Beit and Disc Sander Operates in Various Ways

The Duro heavy duty 10" disc and 6" x 48" belt sander may be used for metal, wood, and plastics. Disc can be operated with or without auxiliary work table, and belt operates in either vertical or horizontal positions. The table, with mitre gage, can be tilted 45° and is interchangeable for use with either belt or disc.

A preloading belt tensioning device permits fast changing of belts without time consuming retensioning and retracking. A quick release lever ejects worn belts in seconds. Forward end guard can be opened to permit operator





Belt operates vertically or horizontally.

to use end of drum for sanding curved objects.

Duro Metal Products Co., Chicago, Illinois.

Use postpaid eard, Circle No. 135

Very Small Fixture Clamp

A really small fixture clamp has been added to the Kant-Twist line. This 2" clamp has all the features of the larger fixture clamps.

Saxton Manufacturing Co., South El Monte Calif.



El Monte, Calif.
Use postpaid card. Circle No. 136

Quick Acting, Positive Holding DRILL PRESS VISE

ONLY \$1150 F.O.B. FACTORY

laws $4-\frac{1}{2}$ " wide, 2" doep, open to $4-\frac{1}{2}$ ". Sets to any angle quickly, saves set-up time, Weighs 16½ lbs. Ask your dealer or order direct.



Sales Service Mfg. Co.

2361 University Ave., St. Paul 14B, Minn. Use postpaid card. Circle No. 407

September, 1959

Best friend a gage ever had . . .

The Minute Man MAGNETIC BASE

360° HORIZONTAL SWING 180°

VERTICAL

A dial gage can go to work instantly, anywhere, with a Minute Man Magnetic Base to hold it. Permanent Alnico magnet has powerful 50 lb. grip on all four sides.

Try Minute Man and find a time-saving, money-saving friend.



CLIP THIS COUPON

The duMONT CORPORATION, Greenfield, Mass.

Please mail Catalog and Price List T on the Minute Man Magnetic Base with new Universal Joint.

Name....

Company

Addres

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INTRODUCING TO THE

UNITED STATES

THE MULTI-PURPOSE

PIONEER

SHEARING & NIBBLING MACHINE FOR THE SHEET METAL INDUSTRY



- 7 MODEL SIZES
- 12 SHEET METAL OPERATIONS
- 18 Ga. to 11/32" CAPACITY
- · WELDED STEEL CONSTRUCTION
- INFINITELY VARIABLE STROKE
 ADJUSTMENT
- THRBAT CAPACITIES FROM 8" TO 59"

Exclusive Franchises Available National Distributor

DION MACHINERY, INC.

1116 GREAT PLAIN AVENUE NEEDHAM 92, MASS.

Use pestpaid card. Circle No. 409

Controlled Belt Movement Omits Tracking Problems

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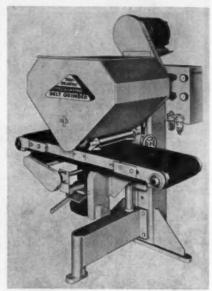
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Deburring, descaling, grinding and polishing can be accomplished on the Tri-Matic oscillating belt grinder. Controlled oscillating movement of the abrasive belt through positive steering without stretching is said to have the advantage of faster cutting, less load-



Work-belt clearance from 0" to 5".

ing, and longer belt life through the shearing action of the abrasive belt. Problem of belt tracking is omitted on any belt width from 6" to 12". Air-jet sensing controls belt oscillation.

Conveyor table height is adjustable, allowing a work-belt clearance from 0" to 5" from conveyor belt to abrasive work-belt. The conveyor, with ½ hp motor, independent of the work-belt, has variable speeds ranging from 60" to 120" per minute. Work-belt is driven by a 5 hp motor at 5000 sfm.

Sales Service Mfg. Co., St. Paul, Minn.

Standard & Hi-Speed Hacksaw Blades

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Recently introduced Tyler Hi-Speed hacksaw blades, of fine tempered Swedish tungsten alloy steel, are said to cut speedily and accurately any kind of material. Tyler Standard super alloy steel hacksaw blades will cut almost any material, and are suitable for home and shop use. Packaged 100 blades per box. Available in either 10" or 12" lengths, with choice of 18, 24, or 32 teeth per inch.

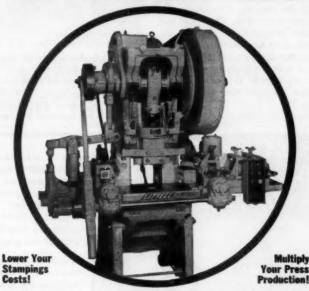
Tyler Manufacturing Co., Inglewood, Calif.

Use postpaid eard. Circle No. 138



Flat saw blades-100 per box.

LITTELL ROLL FEEDS



Littell engineered to fit readily on standard straight sided and OBI Presses. Feed thick or thin stock up to 72" wide at the speeds required for new efficiency and economy in your stampings production.





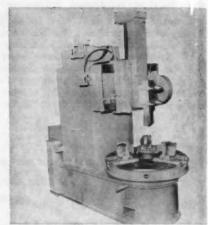
4147 N. RAVENSWOOD AVE. CHICAGO 13, ILL. Use postpoid cord. Circle No. 410

High Speed Vertical Boring Mill Has 42" Diameter Table

Four of this type high speed vertical boring mill are in operation at a large eastern manufacturing plant, producing a finished machined coupling every 17 seconds. Each machine has a 42" dia. table with 24" under fixed cross rail. Six independent table speeds operate from 75 to 400 rpm.

The fully automatic machine is pushbutton controlled. Operator need only load and unload the work. The mill contours the inside diameter of couplings ranging from 3" bores to 15" dia. These bores are of the step type including up to seven steps in number. The tools are automatically designed to cut to the correct depth, feed horizontally in to the correct diameter, reverse its travel horizontally, and return to the upper end of the stroke all within 17 seconds. The length of the vertical tool cut is approximately 7".

In this particular application, inde-



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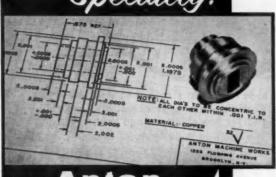
Six table speeds from 75 to 400 rpm.

pendent hydraulic feeds were employed horizontally and vertically in place of the regular geared feed box.

Young Machine Tool Div., Young Testing Machine Co., Bridgeport, Pa.

Use postpaid eard, Circle No. 140





The accuracy which is immediately apparent in the precision part shown, is typical of HUNDREDS of THOUSANDS of parts produced year after year in our plant.

A fully responsible source with unusual facilities for turning, milling of small intricate parts, and enviable performance record in this highly specialized field.

Anton

Machine Works 1226 Flushing Ave., Bklyn. 37, N. Y SEND DRAWINGS OF YOUR DESIGN FOR QUOTATION

Announce New Drills For Portable Electric Drills

The combination of short lengths and heavy duty design in a complete line of power drills enables them to withstand



In fractional, wire gauge & letter size.

considerable strain and drill successfully where full length drills may fail, the manufacturer claims. They are suited for portable electric drills and in the drilling of sheet metals, stainless steel, monel metal, and other hard materials.

The drills are available in fractional, wire gauge, and letter sizes, also in sets.

Whitman & Barnes, Plymouth, Mich.

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SAVE 50%

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CONTOUR GRINDING



Visual Grind is manufactured by

The CLEVELAND GRINDING MACHINE Co.

1670 EDDY ROAD

CLEVELAND 12, OHIO

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BOOK

e of

Large Horizontal Band Saw With 40"x40" Capacity

Reportedly the largest horizontal band saw on today's market, the T-40 has a 40" x 40" capacity. Blade length is 26'9" x 1½" x .035". In two series, the "light" model cuts aluminum, carbon, and plastics. The "heavy" model is designed for cutting large die blocks, s o l i d s, and structural steels.

The light series features variable speed drive, and large trussed, cross-braced columns which afford great rigidity. A calibrated valve

sets the desired feed pressure and maintains unvarying feed throughout cut. Controls are panel-mounted; magnetic switches and push buttons on electrical controls.

The heavy model has all these features, plus a powered conveyor table built through the base to permit ac-



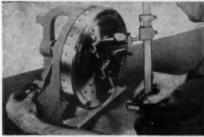
Trussed, cross-braced columns afford great rigidity.

curate positioning of heavy materials. Proper blade tension is maintained hydraulically. Hydraulic vise has adjustable clamping pressure to accommodate all types of work. Blade speed in fpm is shown on direct reading tachometer.

W. F. Wells & Sons, Three Rivers, Michigan.

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Rotary Inspection Fixture Has Sine-Bar, Angle Vernier



Fast-setting 360° angle vernier scale.

Sine-bar accuracy and vernier speed are combined in the Roto-Mike, a rugged precision rotary layout and inspection fixture.

Workpieces mounted on the fixture's faceplate may be rotated quickly and precisely through any desired series of concentric angle settings by reference to the highly accurate sine-vernier measuring ring. This ring has a fast-setting 360° angle vernier scale, and can be indexed to 0°, 90°, 180°, or 270°.

The independent faceplate may be rotated and adjusted separately from the measuring ring, and the two then locked together in any relative setting. This allows the work and the measuring element to be engaged after each has been "zeroed" at its desired starting position.

Each of the dimensions is reported as within .0002" of being perfect. When specified, individual dimensions will be furnished to within .001" accurate, at slight extra cost.

Sorensen Center-Mikes, Inc., Bridgeport, Conn.



Look — at these sheared tubular ends — clean, true contoured and close fitting with a minimum of burr and distortion . . . You can make them fast, some up to

2000 an hour with Vogel patented tools. Or, if you prefer, we can do your notching, shaping, shearing and perforating . . . Either way

You save on cost!

Samples of shearing and notching (also estimates) gladly furnished without obligation.

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ARC-FIT® notches up to 720 per hour.

ARC-SNUG prepares pipe ends for snug brazing—up to 500 pieces per hour.

ARC-TWIN® double notches pipe up to 750 pieces per hour.
CUT-OFF shears tubing in two up to 2000 per hour.

VOGEL TOOL & DIE CORPORATION

1827 North 32nd Ave., Stone Park, III. Use postpaid card. Circle No. 413

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MAN. CAPACITY

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BOUT YOUR DIE S WITH EASE

. SAVE MOUNTING TIME

PREVENT HAZARDS

REDUCE COST

ATENTED

Punch holder and die shoe can be rotated 360° separately, for fast mounting of die sections. Lifting force is equal due to adjustable turnbuckles, thus keeping die set parallel for better alignment and fast trouble-free separation of die set.

BR 3 - 3151

TURN - ABOUT DIE HOIST CO.

604 NORTH HARTREY

EVANSTON ILLINOIS



Use postpaid card. Circle No. 414

September, 1959

231



For tool & cutter grinder. Use postpaid card. Circle No. 144

Center Holding Fixture

Adjustable center holding fixture aids in accuracy for grinding or inspecting drills, reamers. counterbores, end mills, step tools, and ID form tools. The procedure omits trying to accurately collet or chuck a tool for regrinding operations. Work capacity of 6" dia. and 16" length is provided. Unit is readily mounted on the universal vise of any tool and cutter grinder.

Wetmore Tool & Engineering Co., Los Angeles.

INTERNATIONAL HARVESTER COMPANY SYLVANIA ELECTRIC COMPANY EX-CELL-O CORPORATION CARBORUNDUM CORPORATION PRATT & WHITNEY CO., INC. BUICK MOTOR DIV., GMC CHEVROLET DIV., GMC NATIONAL CASH REGISTER FAFNIR BEARING COMPANY WESTINGHOUSE ELECTRIC GENERAL ELECTRIC COMPANY **BROWNE & SHARPE** FORD MOTOR COMPANY INTERNATIONAL TELEPHONE & TELEGRAPH COMPANY **EMERSON ELECTRIC COMPANY** RAYTHEON MANUFACTURING COMPANY EASTERN AIR LINES MINIATURE PRECISION BEARING COMPANY
FEDERAL GLASS COLFANY WESTERN ELECTRIC UNITED SHOE MACAIN GALLO GLASS COMPANY WOODWARD GOVERNOR COM DRAPER CORPORATION CAMPBELL SOUP COMPANY **OLIN-MATHIESON** SPEED LATHE BALL BROTHERS COMPANY PHELPS-DODGE SPERRY-FARRAGUT COMPANY user **ALLEN-BRADLEY** McDONALD AIRCRAFT **OWEN-ILLINOIS** BELL & HOWELL COMPANY NEW YORK CENTRAL RAILROAD ANACONDA WIRE & CABLE CONTINENTAL MOTORS STANDARD PRESSED STEEL RADIO CORPORATION OF AMERICA OVERMYER MOULD COMPANY PENNSYLVANIA RAILROAD ROYAL TYPEWRITER COMPANY
TIFFANY & COMPANY E. I. DUPONT DE NEMOUR HOLLEY CARBURETOR ROBERTSHAW-FULTON U. S. GAUGE COMPANY MANUFACTURING CORP ONEIDA, LTD. HYATT BEARING 4502 Alpine Ave., Cincinnati 42, Ohio

C. G. CONN, LTD.

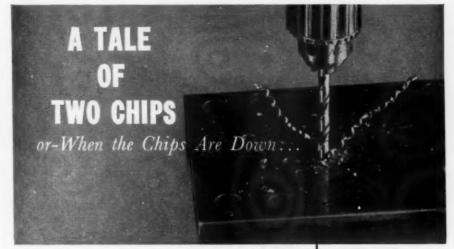
Operator Safe From Flying Metal Chips

Metal chips and oil mist spray are kept away from the work area by a remote exhaust feature. This feature was possible in the firm's new die grinders because the motors are throttled by controlling the exhaust rather than the inlet. Length of exhaust hose functions as muffler in reducing noise. Air is discharged at a point where the outer hose ends, several feet away.

Thomas C. Wilson, Inc., Long Island City, N.Y.
Use postpaid eard. Circle No. 145



Pneumatic die grinder modifying a cage casting.



Do you get more holes per minute • longer drill life • closer tolerance holes • less operator fatigue?

Equal size chips mean you are getting these results from your drills.

Hand sharpened drills should produce equal size chips...but only after time-consuming work by an expert. Now, with the Black Diamond Drill Grinder*, anyone in your plant can do the job with repeat accuracy in just a few seconds. Get the facts by return mail, Write exclusive distributor:

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WATERTOWN, MASSACHUSETTS WA 6-0100

*Black Diamond Saw & Machine Works, Inc.
Natick, Mass.—Manufacturers of Black Diamond and Worcester Drill Grinders.



BLACK DIAMOND DRILL GRINDERS: For #70 drills up to % (Illus.)

WORCESTER DRILL GRINDERS: For 1/4" drills up to 21/4"

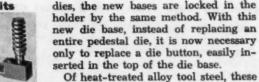
Die Base for Punching Units

Strippit Type CJ hole punching units can now be equipped with a new type die base, reported to cut replacement costs of round and shaped dies by about 50%.

placement costs of round and shaped dies by about 50%.

Interchangeable with the previous one-piece pedestal





Of heat-treated alloy tool steel, these die bases provide rigid support for punching up to the maximum ¼" capacity in mild steel. Made to fit all high-dieblock CJ units, the new assemblies maintain the original unit dimensions for punching close to the inside of angles.

Strippit Type CJ round and shaped die bases, round and shaped die buttons, are available in a complete range of sizes.

Wales-Strippit, Inc., Akron, N.Y.

Use postpaid card. Circle No. 146



"Flo-Reforming" is a process for forming tall, shell-type cylindrical parts. It is based on the use of a Lodge & Shipley Floturn machine plus one or more reforming operations performed on a press, using reform tools.

Basically, the process produces parts similar to those ordinarily made with deep-drawing techniques but lower tooling costs are said to make practical short runs which would not be economical using deep draw methods, equipment and tooling.

Floturn Div., Lodge & Shipley Co., Cincinnati, Ohio.



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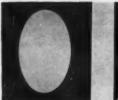
SAVE 50% of positioning time

With one set-up on a Cincinnati Gilbert universal table, you can drill at any angle up to 90° on 5 sides of a cube. Provides maximum support of work piece, assures rigidity and accuracy. Table sizes: 22" and 27" square, 22" high. For complete details and specs, ask for Bulletin 850.



Bulletin 850

THE CINCINNATI GILBERT MACHINE TOOL COMPANY . CINCINNATI 23, OHIO





Starting with a round blank, formed to a cone, followed by a reforming operation, a





fantastic shell height can be achieved.

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For Approximately \$50 You Get 12 Sets, Each Set Ground Ready To Go

Men would not accept

EITHER IDEA AT FIRST

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For approximately \$50 you get a dozen sets of $\frac{3}{4}$ —16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "Unified and American Screw Thread Digest"

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DK

Corresion Inhibitor For Aqueous Systems

Rust-Lick "B," a water soluble corrosion inhibitor for ferrous metals, is said to provide 100% protection against corrosion and rust hazards in aqueous sys-



tems. When mixed with water, it forms

a clear, non-irritating solution not subject to rancidity or bacterial decomposition. It is used in hydrostatic or pressure-testing, cleaning and washing, and heat-treating as an additive to water.

Available in 2, 5, and 55 gallon drums. Rust-Lick, Inc., Boston, Mass.

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Thread Measuring Wire Carriers

Carriers for the widely accepted three-wire method of thread measurement are useful for checking wear of thread plug gages, for inprocess inspection, and for receiving inspection. Carriers are of two





· Pantograph is graduated with reductions from 1:1 to 100:1 and will reduce to any size to infinity.

- · Pantograph and spindle link joints equipped with precision ball bearings throughout.
- · Precision ball bearing cutter spindle.

chine. It does the work of larger

machines, costing much more. **************

- · Collet capacity from 1/10" to 1/4" and standard taper shank cutters.
- · Six spindle speeds-5,000 to 14,000 rpm.
- All feed-screw dials graduated in .001".

Write for complete details and prices For immediate attention write directly to monufacturer below. Ask for neares representative.

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1, $1\frac{1}{2}$, $2\frac{1}{2}$ and 5 lb. sizes—order your alloy lead hammer requirements from your mill supply house or direct from:

KITZMAN MFG. CO.

Manufacturers Of Lead Hammer Products 15061 Hartwell Ave. Detroit 27, Mich.

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We will design and build your broaching tools and fixtures. Send us your broaching tools for sharpening or reconditioning. Most standard keyway broaches in stock for fast delivery.



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13747 S. Western Ave., Blue Island (Chicago Suburb) III.

main kinds-those for micrometers and those for measuring machines having 3/4" dia. anvils.

Micrometer carriers are made especially for Starrett micrometers (.234 spindle and anvil diameter, anvil height .070 min.) and will measure the pitch diameter of American National and Unified 60° threads from No. 0 through 3/4" dia., all standard pitches 10 through 80 threads per inch. Sets are available

containing the 19 pairs of carriers for the above range, plus a micrometer and pair of measuring machine spindle adapters.

A set is likewise available just for measuring machines and covers all standard threads, No. 0 through 1" and 8 through 80 pitch.

Standard Gage Co., Inc., Poughkeepsie, N.Y.

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MODEL 183-10"

Rugged! Every part oversize to give years of dependable, trouble-free service-even on the most difficult grinding jobs. Ideal for use on large, odd-shaped pieces. Other outstanding features include:

- Rugged 3/4 HP Baldor motor won't burnout even if repeatedly overloaded
- Big %" arbor . . . extra large ballbearings!
- Wide-clearance construction provides more working room!
- Dynamically-balanced rotor plus patented wheel balancing process, reduce vibration to a minimum!
- Big 10" fast-cutting, long-lasting wheels!



Single phase, ¾ HP, \$154.00 Three phase, 1 HP, \$150.00

CARBIDE TOOL GRINDER



Model 153-6". Reversible ½ HP motor, 3450 RPM. 1½" wide wheels. Every part oversize for rugged, longlasting use. Just \$189.00.

Write today for Bulletin 321P on complete line of Baldor Grinders and Buffers!

BALDOR ELECTRIC CO. 4353 DUNCAN AVE. ST. LOUIS 10, MO.



Drop-Forged Alloy Steel Hoist Hooks

Series of hoist hooks reportedly offers 25% greater load capacities over carbon steel hooks of the same size. This capacity is said to permit use of alloy hooks one size smaller than corresponding carbon steel hooks yet retains equal or greater capacity. Same physical dimensions offered in the safety and regular, eye or shank patterns. Capacities range from ¾ to 68¾ tons safe working load, using safety factor of four.

J. H. Williams & Co., Buffalo, N.Y.



Triple Bearings Support Workpiece

Rotor live center features two adjustable roller bearings, plus a large thrust bearing, which take axial thrust of workpiece. Available in stock from No. 1 to No. 6 M.T., also large interchangeable head bull centers. Spring loaded to compensate for heat expansion in machining. Guaranteed by manufacturer for concentricity up to .000080".

Webster Machine Products Co., Webster, Mass.



Concentricity to .000080".



CLAMP-TYPE AIR CYLINDERS

Easiest to install or relocate!





UNIVERSAL MOUNTING for easy vertical or horizontal installation.

SLOTTED MOUNTING HOLES save installation, relocation time.

SPRING-RETURN TYPE CYLINDER operates from simple 3-way valve (MODERNAIR CRV or BV series recommended). Has ½" NPT port.

ECONOMICALLY PRICED, TOO!

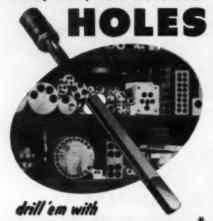
	Price (f.o.b.	. factory)
Bore Size	1" Stroke	2"Strok
136"	\$ 8.50	\$ 9.75
2"	16.00	19.00
3"	23.50	26.50

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Sizes	1/6" to 1/2" dia. in 64ths	1/2" to 1/4" dia. in 32nds
OA Lengths	10", 16", 22", '36"	16", 22", 36"
Drivers	.750" dia. x 2¾" long	1" x 234" long
Tips	Carbide	Carbide

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Sizes	.1250" to 2" dia.	
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Drivers	To fit your need	
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Specializing 100% in GUN/DEEP HOLE DRILLS and Related Tools.

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Height Gage Permits

Exact Dimension Transfer
Hite-Cheks have been designed to eliminate chatter and other vibration in the transfer of dimensions set up by "Hite-Icators," riser blocks, and gage blocks. The units are particularly suit-



Eliminates chatter in dimension transfer

able for use with high-amplification indicators.

Uprights provide rigidity and stability to support any dial test indicator, in any position. Two-piece sliding heads permit quick rough settings.

Three standard sizes are available-24, 36, and 48 inches high.

Industrial Products Div., Brown & Sharpe Mfg. Co., Providence, R. I.

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DANNEMAN DIE SET DIVISION Acme-Danneman Company, Inc.

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MACHINE and TOOL BLUE BOOK

Rapid Tool Change Offered by Collets

The Chi-Co Super-Flex Collet System, ranging from ½" to 2½", is said to provide positive tool-holding because of greater gripping area on tool shanks. The system also features the Chi-Co Collet Ejector Nut for automatic tool ejection, which saves manhours in rapid tool changing. There is self-centering

of the tools. The collets are made of Maxel steel.

Four series are offered. Capacity ranges are—Series A, \%" to \%"; Series B, \%" to \%"; Series C, \%" to \1\%", and Series D, \1\%" to \2\%" (in 1/32" increments throughout). Sizes in 1/64" increments and metrics are available as specials. Accessories are available.

Chi-Co, Inc., Northfield, Ohio.

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- Removing chips, shavings, filings, and airborne debris that clog machinery, distort tolerances, mar product finishes.
- *Controlling mists and fogs in wet machining operations.
- Recovering valuable dusts, coolants, heated air.
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Reducing absenteeism with improved health and safety precautions.

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OK

System of Tooling Eliminates Toolroom Grinding, Adjustments

Development of an economical system of employing the throw-away insert principle in complex multi-point and multi-diameter tooling, called the V.B.U. System of Tooling, has been announced by Valenite Metals, Throw-away inserts can now be used in tooling where boring, chamfering, facing, and other operations are combined in the same tool.

This system completely eliminates

toolroom grinding, sharpening, and adjustments, it is claimed, and tools may be maintained at the machine. The consistent performance of mechanically held carbide helps increase output.

Completely standardized insert-holding cartridges, of extreme precision, are the basis of this tooling, Accumulated tolerances in body, cartridge, and inserts are controlled through cartridge and rest buttons. Once tool is set, inserts can be indexed and replaced



CAPACITY (AT LOW) MAGNETIC BASE RADIAL DRILL PRESS

YET COMPLETELY PORTABLE!

SAVES ON

- MAN HOURS
- SET UP TIME
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Adaptable to all makes of drills-air and electric

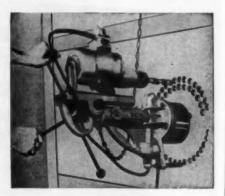
Simple, rugged construction—designed for many years of trouble-free service

Versatile—its compact size makes it suitable for many different appications

suitable for many different applications reaming and tapping time and costs can be slashed with the new BUX

OPERATES IN ANY POSITION WITH NEW RADIAL POSITIONER

does the job of a \$16,000 Radial Drill!

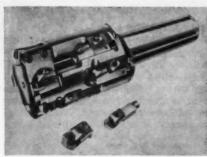


BUX magnetic products

BUCK MFG. CO.

1355 NORTH TENTH STREET

SAN JOSE, CALIFORNIA P. O. BOX 692



Roughs, semi-finish bores, and chamfers.

without further adjustments. Cartridges are stocked in negative, neutral, and positive rakes and varying cutting angles.

Valente Metals, Royal Oak, Mich. Use postpaid card. Circle No. 153

Driving Parts Are Inboard In 15-Ton Press Brake

The heavy-duty, synchronized friction clutch and brake on the 15-ton power press brake available is said to

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already creeted— save money on alteration, creet-ing, and repair work.

Planer -MILLER table length. Builetins

John T. Burr & Son, Inc. Brooklyn, N.Y.

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assure positive, instant ram control, for smooth and sensitive jogging. Friction discs are easily replaced without disassembly of clutch. Laminated nonmetallic ways reduce wear to a minimum.

All driving parts are located inboard between housings for operating convenience, safety and compactness.

Niagara Machine & Tool Works, Buffalo, N.Y.

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For Precision and Reliability Tumico "SUPER-SET"

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3 Flute Ball End Double End 2 Flute Flat End Single End 4 Flute 3/16" Shank 1/8" Shank

Stub Length-1/2" Increments from 1/2" to 1/6"

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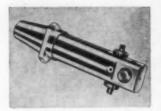
Now 1/4" Increment Sizes in 2 Write for

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Doubles boring feeds without increasing tool load.

Double-Feed Cartridges

To the Sure-Bore boring bar cartridge line the double-feed cartridge (two or more diametrically opposed Sure-Bore cartridges and tool bits, each micrometer adjustable) has been added. This affords doubling boring feeds without increasing the tool load. Most of "spring" in bar is eliminated and regularity of bore size insured. Available for existing boring bars or special requirements.

Portage Double-Quick, Inc., Akron, Ohio.
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Model W-CR-B Model U-TR Model HD-CR

Outstanding, powerful, fast-cutting tools of proven high efficiency. Designed for tough jobs and real production. Perform indefinitely and dependably. Precision made. Steel housing for safety. Also other models.

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EDGEMONT SAFETY CLUTCH provides overload protection through slippage at any preset torque up to 300 inch pounds. Full drive reoccurs when torque falls below the preset value. Standard clutch is integral with single or double grooved sheaves for A or B belts. Five pitch diameters range from 6.2" (A belt) to 11" (B belt).

Edgemont Machine Co., Dayton, Ohio.

Use postpaid card. Circle No. 156





MACHINE PRODUCTS PRECISION EQUIPMENT

You'll hold closer tolerances and increase efficiency, too, when you use Machine Products precision surfaces. Because the combination of superior materials, skilled craftsmanship and rigid quality. controls in the manufacture of Machine Products equipment assures you of the precise dimensional accuracies you require. A complete line of plates and accessories is available, so send for your free catalog today.

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Detroit 12, Michigan

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OOK



New base casting used.

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Improved Automatic Drilling Unit

An improved Model 603 automatic drilling unit incorporates a new base casting which allows a shorter mounting dimension so more reasonable machine bases can be used. A key slot on the center line of the unit is now provided for easier set-up. NEMA standard motors are now used in place of the previous special motor.

The Electro-Mechano Co., Milwaukee, Wis.



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Small Size Magnetic & Non-Magnetic Sine Plates

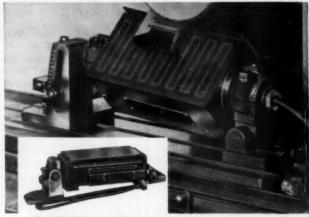
Omer E. Robbins Co. announces a new small size in magnetic (Magna-Sine) and non-magnetic sine plates. These sine plates have a 4"x4" working area. The Magna-Sine table has a strong, fine pole, permanent magnet chuck which firmly holds small work without distortion. The non-magnetic sine plate table has a ground surface and tapped holes for convenient clamping of work.

Omer E. Robbins Co., Detroit, Mich.



 $4'' \times 4''$ working area.

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Adjustable Chucks are available as Duplex, Taper Base or Swivel Base, in work surface sizes from 4" x 8" to 101/4" x 60".

See how easy it is to set up a formed cutting tool on a Taft-Peirce Duplex Base Chuck to grind a compound angle.

Taft-Peirce Adjustable Chucks Save Setup Time, Make Angle Grinding Easy

Speed, precision and simplicity go hand-in-hand when you use Taft-Peirce Adjustable Chucks for tough angular setups.

Superpower Duplex Chucks are a real time saver for grinding simple or compound angles, milling and grinding formed cutting tools, and dressing carbide tipped or steel single point tools. Swivels to 90 degrees either side of horizontal, tilts to 14 degrees, clamps rigidly at any setting.

Complete line of Magnetic Chucks from one source — Taft-Peirce. These are but a few of the great variety of standard and special chucks — both permanent and electro-magnetic — which you can get from Taft-Peirce. Send for Catalog 412, and try one of these in your shop, now.

TAKE IT TO TAFT-PEIRCE



WOONSOCKET, RHODE ISLAND

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BOOK

Machine Assembles Pumps

The Gray assembly machine automatically assembles vane-type pumps from parts: springs, slippers, or vanes, rotor and pump body.

Operator loads rotors and cycles machines. The machine automatically feeds seven springs and seven slippers (vanes) by means of linkage-operated devices. The operator then cycles the stripper, which strips completed rotor assembly into the pump body. The



Optional SWIVEL BASE converts a conven-Optional SwifeL BASE convers a conventional dividing head into a universal work head er rotery table. Change-over is accomplished in seconds without tools or wrenches.

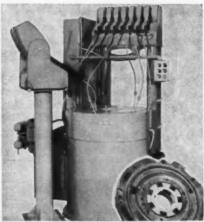
Also available in 10" - 12" sizes and in 10"

spiral drive.

Write for Catalog

CARROLL DIVIDING HEAD CO. 3525 Cardiff Ave. . Cincinnati 9, Ohio

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Automatically assembles 300 pumps/hr.

springs hold it in place. Machine automatically assembles 300 pumps per hour. Operation is combination air and hydraulic.

Gray Equipment Co., Dearborn, Mich. Use postpaid card. Circle No. 159

NEW ADJUSTABLE BURRING TOOL

a handy vest pecket scraper and burring instru-ment. Blades are fully retractable, replaceable and easily sharpened. Cutting length adjustable to 3", can be reversed to use either end, Made from hi-quality, hi-speed tool steel for leng life, ideal for burring in aircraft and other light metal operations—everall length 4½". Complete \$2.54 ea. Min. order 6. Blades \$12.50 dex.

Write for Additional Information. Dealer Inquiries Invited.

TITAN TOOL SUPPLY CO., INC. Box T, 1419 Hertel Ave., Buffalo 16, N.Y

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Catalog furnished upon request

INTERNAL HELICAL LAPS EXTERNAL FINE GRAIN LAP IRON

Helical slot in lap gives faster lapping action and longer lap life-entire area in contact with work. Tapered arbor and I.D. of internal lap permit true expansion. External holder is retractable.

Holes with or without interruptions lapped true to 1 millionth.

Internal: 1/16" to 1-1/4" by 64ths, 1-5/16" to 3" by 16ths.

External: 1/8" to 1/2" by 64ths, 17/32" to 1" by 32nds.

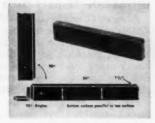
MERICAN LAP COMPANY 20182 SHERWOOD . DETROIT 34, MICH.

Black Granite Straight Edge

The new parallel straight edge 90° angle side checks squareness, parallelism and straightness, and is available in three grades: 25 millionths (laboratory grade), 50 millionths (inspection grade) and 100 millionths (tool room grade). Other items in the Collins line include box parallels, 15" precision levels, etc. Manufactured from genuine Hyperstene Gabbro black granite.

Collins Microflat Co., Hawthorne, Calif.

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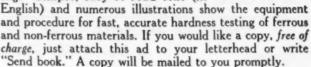


90° angle side.

GET THE FACTS

About Hardness Testing

Everything you need to know about hardness testing is told in this handsome book, prepared by the makers of the internationally respected CLARK Hardness Testers for "Rockwell Testing." Simple, easy-to-read text (in



P.S. If you are interested in descriptions and prices for CLARK Hardness Testers (Standard and Superficial) of guaranteed accuracy, say the word and we'll gladly supply them.



CLARK INSTRUMENT INC.

10206 Ford Road . Dearborn, Mich., U.S.A.

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BOOK

Ultrasonic Impact-Drill

A new Glennite ultrasonic impactdrill is claimed to be the only piezoelectric drill available to industry. The 100-watt machine will drill faster and larger areas than previous models and free the operator from constant readjustments as he performs his work.

Principal feature is the automatic tuning control system. As the impedance changes, the impact-drill re-



the latest completely illustrated

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A complete line of vises and rotary tables for production, tooling and maintenance.

68 different models and types. Vise jaw sizes from 1½" to 8".

PALMGREN STEEL PRODUCTS

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Retunes when impedance changes,

tunes automatically without waste of operator's time. Versatile in performance, it drills, slices, engraves, shapes, taps, broaches, dices, shaves, trepans, and machines.

Vibro-Ceramics Div., Gulton Industries, Inc., Metuchen, N.J.

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CAMS

To Your Specifications except Screw Machine Cams

Design Assistance Offered

KIDDE PRECISION TOOL CORP.

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You Need an Extra Hand Now

to Speed Up Production!

HEIMANN TRANSFER SCREW SETS



Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every jeb. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool

HEIMANN MFG., CO. ● URBANA, OHIC

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Polishing Brushes For Use With Diamond Compounds

Hyprez polishing brushes, designed primarily for use with the rotary handpieces of the Di-Profiler reciprocating hand machine, may also be used effectively with any type rotary hand tool. These brushes provide for effective final finishing with diamond compounds. Three shapes—end, wheel, cup—are available.

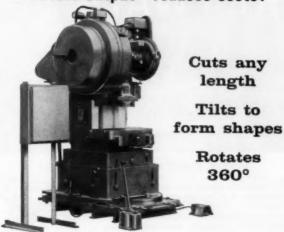
Hyprez Div., Engis Equipment Co., Chicago.



End, wheel, cup shapes.

"FLYING CUTOFF"

boosts output-reduces costs!



Federal's new "Flying Cutoff" is adaptable to a variety of metalworking operations where rolling mills are used. It can double production ... cut costs... help you beat competition. Air-clutch control panel synchronizes press with speed of mill—permits cutting bars, channels, angles, other shapes to any

length—continuously. Custom fabricated base provides for 360° rotation of the press. Hydraulic power permits tilting at any angle to form shapes. One-piece, machine tool grade cast iron frame, finest workmanship, and many other quality features. Up to 100-ton capacity. Write for catalog!

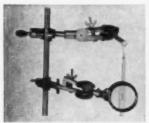
FEDERAL PRESS COMPANY, 910 Division Street, Elkhart, Indiana

FEDERAL PRESSES

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OK



Logan sleeve is mounted by clamping into any laboratory or burette clamp.

High Powered Magnifier Has Lab Base

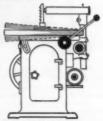
"Precision Vision," designed for science and industry, will improve many procedures in the application of magnification to professional and technical pursuits. It is a five-power, wide field, non-distorting magnifier equipped with the Logan universal Lab-Base. This permits setting the 5X magnifier in any plane or angle for quick focusing. Friction sleeve, attached to magnifier, is free to rotate.

S. B. Logan & Co., Genoa City, Wis.



WITH DAVIS KEYSEATERS!

You can cut accurate, low-cost internal keyways at minimum cost with Davis Keyseaters. Here's why: (1) operation is designed for production speed; (2) machine sets up easily, does not require skilled operator; (3) maximum concentricity of the keyway in each bore assured; (4) Built in 2 sizes. Keyways range from \(\frac{1}{16}'' \) to 1". High speed steel cutters stocked in all sizes; (5) the best keyseater of its type, yet inexpensive! Write now for FREE DETAILED LITERATURE!



Tilting table sets easily for tapered keyways up to 3" per foot.



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CARBIDE HAND FILES, in two new series, feature an offset handle. One style comes with a knob on the forward end, the other style is plain. Both are available in a range of five cuts from fine (40 teeth per inch) to coarse (16 teeth per inch). Files are used on hard abrasive materials, as well as chilled iron, hardened die steel, glass, ceramics, plastics, etc. Regrinding service offered.

Severance Tool Industries Inc., Saginaw, Mich. Use postpaid card. Circle No. 179



IMMEDIATE DELIVERY OF CONTOUR CUTTERS For Standard Hydraulic Fittings ... In Stock

AND 10050 Port Cutters



Turret Lathe and Drill Press Series: Carbide Tipped, integral reamer



Economy Series: Carbide Tipped, integral end pilot



Versatile Series: Carbide Tipped, interchangeable end. pilot and reamer



High Speed Steel Series: Integral end pilot, Super H.S.S.

"MS" Port Cutters



MS 33514: Carbide Tipped integral end



MS 16142 "SAE": Carbide Tipped interchangeable end pilot and reamer



MS 33656 E and G; MS 33657E and S Stocked in Carbide Tip and H.S.S.



MS 33514E: MS 33515E and \$ Stocked in Carbide Tip and H.S.S.

Wetmore stocks the fullest line of Port Contour Cutters and Flat Form Tools for Standard Hydraulic Fittings to assure fast delivery. Where required, modification of standard contours can usually be made within 48 hours.

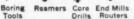
For Special Cutting Tools, Wetmore offers the finest design and manufacturing facilities backed with extensive experience to combine operations and also to machine "problem parts."

Write for NEW Free Catalog.



Wetmore Tool and Engineering Co. 5320 E. Washington Blvd., Los Angeles 22, California











Cutters



Cutters

Cutters Use postpaid card. Circle No. 445

Power Source Safety Device

This safety multiple lockout, made from heavy duty ½" thick hard steel, eliminates the possibility of any type of tampering. When two or more men are engaged at a certain power source, the switch box or control levers may be locked by one or more men. The power source can only be cleared when all such men clear their locks from

LOW COST 5" Magnetic
Sine Bar
ONLY
\$149.95

MODEL
\$1805M

5" x 3" WORKING SURFACE
ON PERMANENT MAGNETIC CHUCK

Positive locking provides rigid set-up for light machining operations. End and side plates allow occurate locating of pieces on magnetic chuck making it a versatile, low cost fixture. Ideal for production, inspection or tool room.

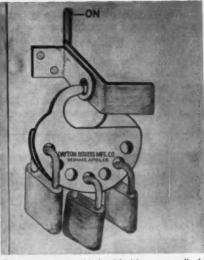
OTHER MODELS include 5" and 10" sine bars and plates, single and compound angles, plain and magnetic. Solid eak cases available.

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The complete Bald Eagle line starts at \$21.75, F.O.B. St. Paul. Order your sine har or plate from your dealer or direct,

BALD EAGLE PRODUCTS DIV.

356 Cedar Street, St. Paul I, Minneseta Use postpoid cord. Circle No. 446



Each man is provided with his own padlock.

the multiple safety lockout. Each man is provided with his own keyed padlock.

This serves as a personal means to lock out all power sources when it is necessary for such stoppage. When the last workman removes his personal padlock, the lines are clear, and the power source can be re-established.

Insulated model is made of 3/16" laminated Bakelite.

Dayton Rogers Mfg. Co., Minneapolis, Minn.

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MOISTURE ABSORBING RUST-PREVENTIVE LUBRICATING

Mist TOOLS • DIES • JIGS

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METAL PARTS • IDLE MACHINERY

STORAGE . TRANSPORT OR IN PROCESS

Used by leading manufacturers and metal fabricators. Also available in bulk—5 to 55 gallon drums.

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Fire-Resistant Hydraulic Fluid

Sunsafe hydraulic fluid may be used in any hydraulic system where a fire-resistant type fluid is needed, at pressures to 2000 psi, operating temp. up to 150F. It has a very high viscosity index (130) with excellent anti-wear and anti-rust characteristics. Available in two grades—one for use in industrial machines and systems, the other, in hydraulically operated mining machinery.

Sun Oil Co., Philadelphia, Pa.

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In tests, will not ignite.

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Send today for the new illustrated catalog showing Foredom Flexible Shaft Machines — and the widest variety of handpieces available anywhere; pencil thin for sensitive control on even the finest work. Small, convenient and precision built to last, this equipment fills many needs at very low cost.

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FOREDOM ELECTRIC CO., INC.

Bethel, Connecticut

Price Assess

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Accurate to .001",

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Precision Vernier Calipers

Vernier calipers, with a reported accuracy of .001", are manufactured of hardened stainless steel with ground and lapped measuring faces. Raised edges along both sides of the scale prevent defacement of the graduation by sliding of vernier. Model J No. 20-SC is priced at \$13.50 with leather case; Model J No. 23-SC, \$14.75 (with auto thumb lock), and Model J No. 25-SC \$14.75 (with microadj. screw). 8", 10", 12" sizes also available.

Transocean Trading Co., Los Angeles, Calif.



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Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion WHEEL DRESSER

dress two angles tangent to a radius in one continuous motion



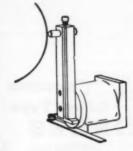
With the unique "Fluidmotion"

Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion.

Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

- A. Obtain micrometer reading; add required convex radius or subtract required concave radius.
- B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.
- C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

See your industrial distributor or write for free literature.



CLAMPCUTE

J & S TOOL CO., INC.

880 DORSA AVE. LIVINGSTON, NEW JERSEY

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September, 1959

257



MOUNTING BLOCK for the square shafts used in die automation operates lifter arm for removing panels from dies. The same block is used in conjunction with arm, push rod and air cylinder to actuate square shafts. The mounting block lifter accessory has application for draw dies, trim dies and flange dies. A slot is provided in the block for lifter arm.

Jolico Industries, Allen Park, Mich.

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BY A QUICK, EASY INEXPENSIVE METHOD s letterhood will bring literature WATTS BROS. TOOL WORKS Wilmerding, Pa.

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SPEEDY-SAFE NON-POISONOUS

CASE HARDENING

Indispensable for Tool Rooms, Machine Shops, Schools, etc. Now available in 1, 5, 10, 25, 50 and 100 lb. containers. Write for Free Catalog

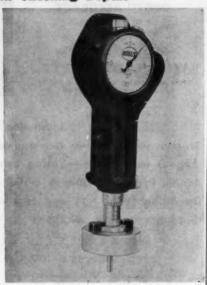
KASENIT CO.

Est. 1912 1 King St., Mahwah, N.J.

Use postpoid cord. Circle No. 452

CONTINUOUS

Instrument Saves Time In Checking Depths



Eliminates dozens of manual operations.

CLOSED Plain Type

AUTOM TRADE

CLOSED

MARK

Offset Type HINGE

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET

AUTO MOULDING & MFG. CO. 1110 E. 87TH ST. CHICAGO 19, ILL.

Use postpoid card. Circle No. 453

SPECIFICATIONS Open width 1/s to 6"
Gage Material .040 to .125 O
Pin Diameter .101 to 3/s
Lengths to 120"

A visual, depth-indicating micrometer is claimed to eliminate dozens of manual operations previously needed to check depth dimensions.

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trim

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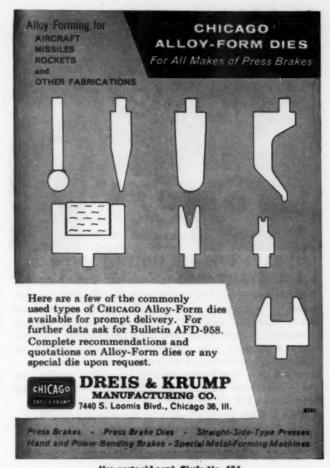
Called the "Besly Readepth," the instrument has a large, easy-to-read dial. One reading replaces the trial-anderror method.

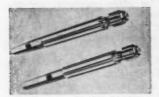
The micrometer can readily be set to changed dimensions. It is accurately reset with the masters supplied, so no Jo-blocks or other masters are required. Constant accuracy from 0 to 3" is assured, because resetting is required only when the contact rods are changed.

Readepth can be used to check the depth of holes, slots, keyways, etc. It comes in a solid oak case that helps protect it.

Besly-Welles Corp., South Beloit, Ill.

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Shell-type expansion reamers.

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Reamer Uses Replaceable Shell

Replaceable shell is now a feature of Standard's carbide-tipped expansion chucking reamer. The shell can be expanded to compensate for wear during use. The shell-type cutting element can be easily replaced. Shell-type, carbide-tipped, expansion reamers are available with straight or tapered shanks in sizes from 1/2 to 11/2" dia. in 1/16" steps. Replacement shells are available in the same range.

Standard Tool Co., Cleveland, Ohio.



GAGE SURFACE FINISH TO NEW A.S.A. STANDARDS - Quickly - Accurately

This convenient pocket comparator has 22 precision surfaces for specifying and controlling finish to the new A.S.A. Standard B46.1 - 1955. Electroformed in durable corrosion-resistant nickel, the S-22 Comparator provides every department with the most inexpensive method for uniform, accurate control of finish characteristics.

Save valuable time in engineering, inspection, quality control — eliminate costly overfinishing in purchasing and production. \$17.50 complete with leather case.

Available from leading industrial distributors, or write



FAIRFIELD DEVELOPMENT LAB., INC. (SUCCESSOR TO BAPTIST MACHINE CO.) 38 Ludlow Street, Stamford, Conn.

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Hold Down Clamps Eliminate Shims

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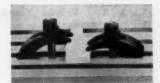
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Insta-Clamps, of heavy duty steel forgings, clamp without shims to the full capacity of the clamping, eliminating time wasted and need for vises on many jobs. The clamps will not tip over when clamping on to narrow grooves or corners. Application is to fixtures and jigs on universal and vertical mills, jig borers, punch presses, planers, and drill presses.

Insta-Clamp Co., Dearborn, Mich.



Will not tip over when clamping in grooves or corners.

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The world's finest rubberized abrasives for deburring, smoothing and polishing tools, dies, patterns, molds, models, instru-ments and component parts.

Kit contains 80 wheels and points in the most popular sizes and shapes, equally assorted in four grit textures, coarse (C), medium (M), fine (F), extra fine (XF)...plus four mandrels for '4" chuck...packaged in plastic box, compartmented for fast selection. \$7.50 complete.

Order your new Cratex Tool & Die Makers Kit #777 through your distributor - or, send your order to us for delivery by the Cratex distributor nearest you.

CRATEX Free 8-page catalog available on request.

MANUFACTURING CO., INC.

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E BOOK

Taps Are Triple Tempered for Toughness



Resists chipping, breaking. Use postpaid card. Circle No. 171

The Triple Temper Process has been applied to Sossner's taps to provide increased resistance to chipping and breaking. This process develops the "toughness potential" into an extra final toughness previously unobtainable, the company claims. The "toughness potential" structure, combined with Triple Tempering, is reported to effectively increase tap life.

Sossner Tap & Tool Corp., Lynbrook, L.I.

NEW! Profilometer GROUP III



Measures Roughness of Surfaces from 1/8" to Flat - ID and OD

NEW Type LK Tracer measures on ID's and OD's as small as 1/8"; flats; tapers; narrow splines; gear teeth.

NEW Type QC Amplimeter shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on easyto-read meter. Has 3 standard roughness width cutoffs. Lightweight and portable; built for shop use; factorycalibrated for dependability.

WRITE for descriptive literature.



Profilometer is a registered trade-mark.

MICROMETRICAL MANUFACTURING COMPANY

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Cross-Slide Table of Meehanite

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A light-weight, precision cross-slide table, constructed with all castings of meehanite iron, has top and bottom precision ground while all ways and gibs are hand scraped. The table top is 8"x12", and has 4 tee slots with 6" scales on each slide. Dials are graduated from .001—.050 per revolution. The unit fits all rotary tables 12" or more for radii and angle milling on all vertical milling machines.

Lawrence H. Cook, Inc., E. Providence, R.I.



Table top 8" x 12".

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BOOK

Dryer Line Expanded

The Hayes Molecu-Dryer line of air and gas dryers has been expanded to include both smaller and larger capacity models. These units utilize superinduced conduction to obtain continuous operation without the use of blowers, heat exchangers, or separate purge gases.

Self-contained design permits high temperature drying to dew points of minus 100° F or better. Reactivation is effected by arrangement of conducted

ute Grinder



Both smaller and larger models added.

heat in dessicant bed with cooling cycle accelerated by same medium. No inert gas purging for reactivation is needed.

Models now available include: MS-5.



ral or straight reamers and end mills from solids on a production hasis and save money.

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MUMMERT-DIXON FACING HEADS with Automatic Feed

One-way Tool Feed-8. 9 and 12" sizes.

Two-way Tool Feed-9, 12, 16 20, 24, 30, 36, 40 and 46" sizes. Save many costly set-ups. Bulletin No. 4141 Gives Full Details

MUMMERT-DIXON CO. 122 Philadelphia St., Hanover, Pa.

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to 250 cu ft/hr; MS-10, to 500 cu ft/hr; MS-30, to 1500 cu ft/hr: MS-60, to 3000 cu ft/hr; MS-120, to 6000 cu ft/hr. Larger sizes are available upon request.

C. I. Hayes, Inc., Cranston, R. I. Use postpaid eard, Circle No. 173

Custom-built Lab Press

This special 100-ton Hydrolair unit was designed for the experimental laboratories of a producer of chemical and plastic materials. To meet work requirements of extremely high operating tem-



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BOOK

Built for high operating temperatures

peratures (900° to 1000°) and an exceptional degree of accuracy in platen movement, the press features special adjustable gibs and machine columns with flat portions on which the gibs provide maximum bearing.

Additional supporting gibs contact the round portion of columns to help prevent binding and cocking of platen. Keys bearing against the column flats insure against any column twist.

Special laboratory-type reading gages of an unusually high degree of accuracy were substituted for the conventional gages which are ordinarily furnished.

Elmes Engineering Div., American Steel Foundries, Cincinnati.

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Now you can obtain non-marring Lead hammers - Hammer handles - Make 'em yourself - Production and Ladle Molds. Free folder - ask about our Remelt allowance service.

COMPLETE FAD HAMME SERVICE

ALL AT LOW LOCAL PRICES

Cook's Lead Hammer Service -East Providence 14, R.I.

Western Division-Hy-Flex Industries **4271 STATE STREET** POMONA, CALIF.

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101 REPAIRS

3 lbs. 1 10 Spreads like paste - Hardens to metal Metal - Wood - Plester - Gless - Plestic EASY! FAST! NO MIXING!

Available at your distributor or write ALVIN PRODUCTS, Inc. Worcester 4, Mess. Use postpoid card. Circle No. 463



Tamms Industries Co.

228 N. LaSalle St. . Chicago, III. Use postpaid card. Circle No. 464

September, 1959

265

Three-Point Contact Spots Errors

An improperly adjusted centerless grinder can produce work deceptively out-of-round. Two-point measuring tools, checking diameter only, may pass the work. No. 483 V-Anvil micrometer features a three-point contact which quickly detects out-of-round, alerts to machine adjustment. This tool also measures three-fluted cutting tools—taps, milling cutters, etc. The No. 485 measures five-fluted cutters.

The L. S. Starrett Co., Athol, Mass.



Mike checks centerless ground work for out-of-roundness.

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48-Hour Delivery* of Tooling for Special Internal Forming

for Brown & Sharpe and other makes of Automatic Screw Machines

Send for this FREE SAMPLER KIT



See how these radial relief tools are ground, why they are so free cutting, how they produce quality parts (nonferrous or steel) at very low cost. Prove in your own way, at your convenience, just what B & W has to offer.

Just mail this ad clipped to your letterhead, sign and we'll send the Sampler Kit to your personal attention. No obligation and return postage is enclosed in case. Tooling retained will be billed after case is returned.

*with overtime.

B & W PRECISION PRODUCTS CO.

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23 page

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Illustrated Literature on Request A few desirable distributor territories still available.

WALLS SALES CORPORATION

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DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
1/4	\$ 6.00	\$ 2.85
1/2	12.00	5.00
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1	30.00	10.25
11/2	54.00	15.00
2	75.00	20.00
21/2	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for \$1.00 each extra.

Order today—Immediate
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Machinery Exchange, Inc.

Dealers in Tool Room Equipment

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13

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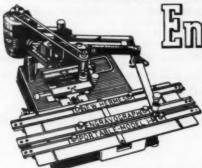








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 Page 107
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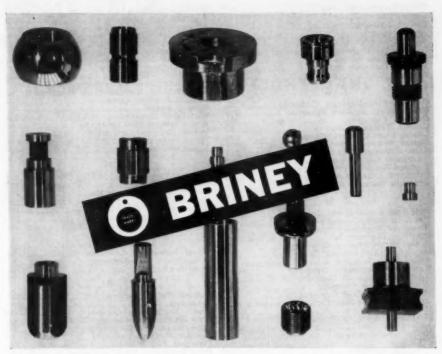
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	48-56-64-72-80-90	.,_	28-32-36-40	1-13/16	8-10-12-14-
3 4	48-52-54-56-64-72-80	9/16	12-14-16-18-20-24-27-28-	1-10/10	16-18-20-24-32
3	40-44-46-48-56-60-64	-/	32-36-40	1-7/8	5-8-10-12-14-16-
4	32-34-40-48-56-60-64	5/8	10-11-12-14-16-18-20-24-	1-0/0	18-20-24
-	72-80	0,0	27-28-32-36-40	1-15/16	5-6-8-10-12-
5	30-32-36-40-44-48-56-	11/10	10-11-12-14-16-18-20-24-	1-10/10	14-16-18-20
-	64-80	,	27-28-32-40	2	14-16-18-20
6	30-32-36-40-48-56-60-64	3/4	10-11-12-14-16-18-20-24-	2-1/16	8-10-12-14-16-18-20
	72-80	0/4	27-28-30-32-36-40	2-1/8	
7	30-32-36-40-48-64	13/16	10-12-14-16-18-20-24-27-	4-1/8	8-10-12-14-
7	24-30-36-40-44-48-56-60-	10/10	32	2-3/16	16-18-20
-	64-80	7/8	9-10-12-14-16-18-20-24-	2-3/19	10-12-14-
9	24-28-32-36-40	1/0	27-28-32-40	0.44	10
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	56-60	1	8-10-12-14-16-18-20-24-	2-5/16	12-14-16-
14	29-24-28-32-40		6-10-12-14-16-18-20-24-		18
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5/64	72	1-1/10	10-12-14-16-18-20-24-27-	2-1/2	4-8-10-12-
3/32	36-48	4 4 40	32		14-16-18
1/8	32-36-40-44-48	1-1/8	7-8-10-12-14-16-18-20-	2-9/16	12-14
5/32	32-30-40-44-48		24-27-32-36	2-5/8	8-10-12-
3/16	32-36-38-40-44-48 20-24-28-32-36-40-48	1-3/16	8-10-12-14-16-18-20-24-		14-16-18
			27-32	2-3/4	4-8-10-
7/32	20-24-28-32-36-40	1-1/4	7-8-10-12-14-16-18-20-		12-14-16
1/4	14-16-18-22-24-26-27-28-		24-27-32	2-7/8	8-10-12-
0.700	30-32-36-40-48-56-64	1-5/16	6-8-10-12-14-16-18-20-		14-16
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1	56-64-72	7/16	14-29-28	1-7/16	8-10-12-14-16-18-20
2	56-64	1/2	12-13-20-28	1-1/2	6-8-10-12-16-18-20
3	56	9/16	12-18-29-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-18-20-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-16-18-20	1-3/4	8-10-12-14-16-18-20
8	32-36-40	13/16	16	1-13/16	8-10-12-14-16-18-20
10	24-30-32-40	7/8	9-12-14-18-20	1-7/8	8-10-12-14-16-18-20
12	24-28-32	1	8-12-14-16-18-20	1-15/16	8-10-12-14-16-18-20
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